The
Electrical Review

VOL. CXVI. MAY 3, 1935. No. 2997.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain. SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Index to Advertisers—See page xlii.

Principal Contents:

	PAGE
Twenty-five Years	619
Twenty-five Years Ago	622
The Tir John Station	624
Coal-face Machinery. By G. Barnard	626
Design and Performance. By E. T. Norris	627
Water Heating for Contractors. By J. Russell Hickmott	628
Electrical Sewage Pumping at Barking	629
American Power Trusts. By Walter M. Russell	630
Meetings and Discussions	632
Correspondence: Should Salesmen be Able to Cook; Street-lamp Maintenance; The Rules and the Register; Registration is Vexation; The Magnetic Field; Help for the Pioneers; Colliery Electricians' Wages	633
New Apparatus and Devices	635
Hire or Hire-purchase? By L. Norris	637
New Books	638
Electrical Imports of Australia	639
Business and Industrial Notes	640
The British Industries Fair	643
Electricity Supply	644
Next Week's Jubilee	645
Traction and Communications	646
Contract Information	647
Our Personal Column	649
New Companies Registered	650
City Notes	651
Published Specifications	653
New Work for Contractors	654

Twenty-five Years

WHEN millions of loyal subjects are entering upon a period of rejoicing in connection with the Silver Jubilee celebrations, it will be fitting to express here the hope and prayer that His Majesty King George V, may long be spared in health and strength to reign over us and that for all his peoples of whatever race, colour or creed, there may be many years of unbroken peace, prosperity and happiness.

In the atmosphere created by a royal event of supreme interest, there is a natural inclination, in the ELECTRICAL REVIEW, to reflect upon the electrical changes that have so clearly marked the progress of the past twenty-five years. Since His Majesty came to the throne in 1910, electrical science and industry have continuously advanced—even the war did not seriously interrupt their course.

One of the chief impressions gained from memory, but supported also by an examination of earlier volumes of this journal from which the notes and illustrations appearing on subsequent pages have been derived, is that the most noteworthy electrical achievements of the period under review have been in the practical application and development of existing ideas, inventions, and principles, and in the much-needed reform of our old systems of organisation and legislation, rather than in the production of epoch-making discoveries and inventions. Concentration of industrial minds upon reorganisation schemes has, however, proceeded simultaneously with zeal in research and standardisation, and, as a result, we may say without any hesitation that British electrical engineering rests upon a more secure foundation to-day than at any previous stage in its history.

In nineteen-ten, many problems affecting the industry clamoured for solution, and the original electrical manufacturers' association underwent transformation in readiness for larger service. B.E.A.M.A. emerged and for twenty-four years has been removing some of the hampering influences which prevented our firms from effectively competing with foreign rivals who were organised in large units.

The constitution of the industry as we see it to-day clearly tells the story of changes that have taken place. In those earlier days retarded electricity supply deprived the manufacturer of an adequate or assured home market. The extreme competitive spirit, however, gave way before the policy of co-operation, and efforts to permeate the industry with this ideal, efforts which still continue, cannot be denied a place among the outstanding electrical influences of the period. Perhaps one of the greatest hopes of this Jubilee Year, partly from the Convention which is to take place at Bournemouth in June, is for still more electrical co-operation.

Shortly after the end of the war the nation's attention was turned to the important question of electricity supply legislation, and the setting up of the Commission and the Central Board and the design and construction of the national grid scheme have been the outcome. This, of course, has been one of the greatest forces that has ever been brought to bear upon Britain's electrification.

What has been happening in the manufacturing and electricity supply industries has been but typical of what has been occurring in the electrical world generally. As the remarkable advance of the profession and industry have proceeded many new associations have been formed, existing institutions have considerably increased their membership. Millions of the population have become users of electricity and the reader will recall many other factors which have combined to make it true that at this period of Britain's history we have definitely reached the Electrical Age.

Under the continued beneficent reign of King George, may we witness the unceasing contribution of electricity and electrical science and engineering to the common good of humanity.

Tir John

THERE appear to be great expectations of good results to be obtained from the new Tir John generating station of the Swansea Corporation, although there is also some speculation, and the first few years' working will be worth watching closely. The station is a fine example of engineering, and it will, no doubt, be the South Wales "show house." But it will not be a profitable hunting ground for those looking for unusual or intricate equipment. Rather will Tir John depend for its results on simplicity of layout, both with regard to its equipment and to its arrangement, with perhaps the exception of automatic boiler control, although, of course, that will mean simplicity in actual working. The results from burning anthracite duff will provide the answer to the biggest query, but the adequate low-temperature condensing water and the absence of main transformation on site will be other deciding factors.

Unauthorised Extensions

THE amateur wireman who, on the strength of an ability to renew a blown fuse expeditiously, believes himself qualified to carry out extensions to his lighting installation may be a danger to others as well as to himself. How often is a handy piece of twin-twisted flex used temporarily to spoil an otherwise sound permanent installation—"temporarily" signifying the length of time for which it will stand up to the conditions of use! Often the unauthorised extension is made to a damp out-building, creating a risk of shock, which would be almost absent in the house itself where the installation would be carried out on approved lines. There are no official records of the proportions of accidents that are so caused, but a fatality at Swansea due to the use of flex for extending the lighting installation in a bathroom to a point outside has provided another instance. The coroner drew attention to the rules of the supply undertaking that no extensions should be made without its authority—a rule which, we fear, is everywhere more honoured in the breach than in the observance.

A Fireman's Experience

IN our issue of April 12th, we commented on the newspaper reports of an electric shock said to have been received by a fireman when he turned his hose on to a burning building. We pointed out that in view of the low-voltage of the installation, such an effect was inconsistent with the results of tests carried out by the Central Electricity Board at 132kV. Further investigation has shown that the insulation of some flexibles under the cornices had been damaged by the heat, and the fireman on entering the first floor window, after a liberal use of water had quenched the fire, established a circuit from the electrically charged floor to the earthed nozzle held in his hand. This is, in one sense, a reversal of the position envisaged, in which the fireman was supposed to receive a shock *via* the water jet and nozzle to the earth upon which he stood.

Welded Ships

THE merits of fabrication were first realised in the electrical industry, which has set an example to others of what can be done in this way. During the past three or four years increasing interest has been displayed in its possibilities by shipbuilders, and claims have been advanced that the substitution of electric welding for riveting gives not only a stronger structure but also one that is from 12 to 20 per cent. lighter, while the saving in cost has been estimated at upwards of 10 per cent. The largest all-welded vessel yet constructed in this country according to *The Times* is the tanker *Moira* with a dead-weight carrying capacity of 2,240 tons and a length of 245 ft. She has been built for a Norwegian firm and was launched on the Tyne on Tuesday. Rivets have been entirely dispensed with, the complete ship being welded throughout by the arc process. Messrs. Swan, Hunter and Wigham Richardson have also under construction a cargo vessel for Canadian owners, which will be the largest fabricated vessel in the world. In addition to the economic advantage of lightness, the absence of caulking and reduced risk of leakage should materially influence the position in favour of welding.

Fuel Consumption

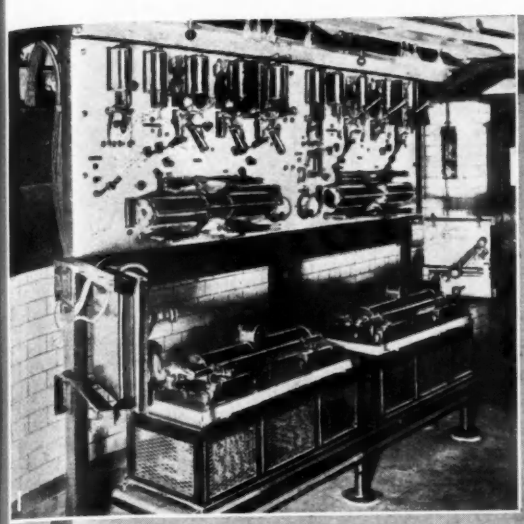
THE "Fuel Returns" for 1934 have been published nearly ten weeks earlier than last year and their value is thereby considerably enhanced. The Electricity Commissioners have seemingly some difficulty still, after fourteen years, in obtaining particulars from some of the undertakings, and in a few cases even now the simple particulars required are not available. In the steam stations Barking B gains first place for thermal efficiency with 27.95 per cent., Battersea having the lowest coal consumption per kWh generated at 1.06 lb. Both are notable advances over 1933 when Clarence Dock achieved the premier position on both counts with 26.06 per cent. and 1.12 lb., figures that it has improved on during the past year. In none of the first four groups (with individual outputs of 25 million and upwards) does the station with the highest thermal efficiency secure the best coal figure, indicating a preference for coal of a relatively high calorific value by many owners of selected stations. The limits of thermal efficiency in determining the comparative value of stations are shown by the performance of the small oil-engine stations, eighty-nine of which, out of a total of 145, return over 20 per cent. compared with thirty-one out of 267 steam stations. In this class Yeovil puts up the remarkable record of 31.07 per cent. and ties with St. Martin's Lane (Charing Cross Co.) for the least amount of fuel used, i.e., 0.58 lb. per kWh generated.

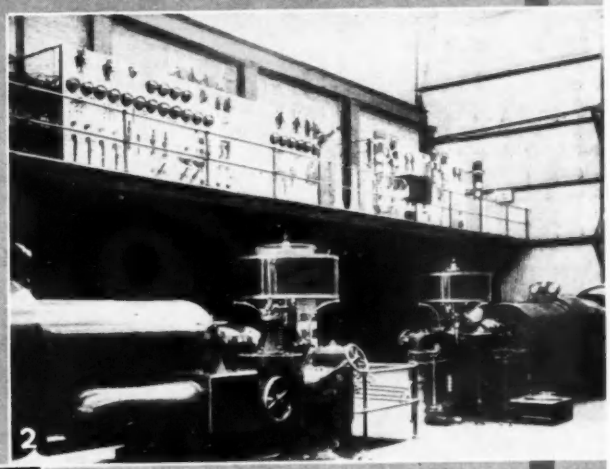
No Sulphur from Fulham

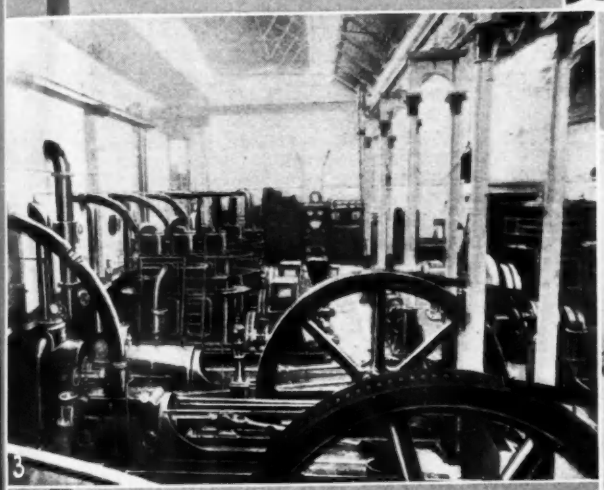
OFFICIAL consent to the erection of the new Fulham power station was given subject to the adoption of means to remove sulphur from the flue gases. When our account of the constructional features of this station appeared three weeks ago, the results of the tests on the plant to be installed had not been made public. This week the committee, presided over by the Government Chemist, reports that it is satisfied that the method used in an experimental plant at the I.C.I. works, Billingham (in which a recirculating aqueous medium is treated with lime or chalk) will secure nearly complete absorption of the sulphurous acid without an excess of reagent. Large supplies of water are not required and there would be no risk of pollution of the river. A description of the I.C.I. plant was given in a paper read by Dr. J. L. Pearson and Messrs. G. Nonhebel and P. H. N. Uhlander before the Institution of Electrical Engineers and the Institute of Fuel on January 17th and reported in the ELECTRICAL REVIEW the following day. In this the cost of a central plant was given as £1 1s. per kW and 0.015d. per kWh or 2s. 1d. to 2s. 4d. per ton of coal burned. If the process gives a wider range of fuel for selection, the net cost of washing might be less than the figures given by the authors.

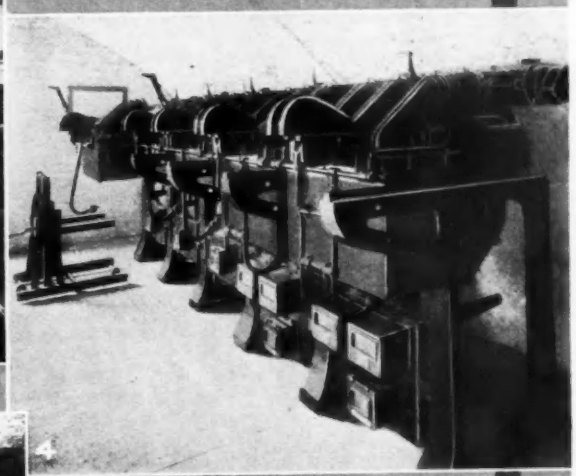
Northern Ireland

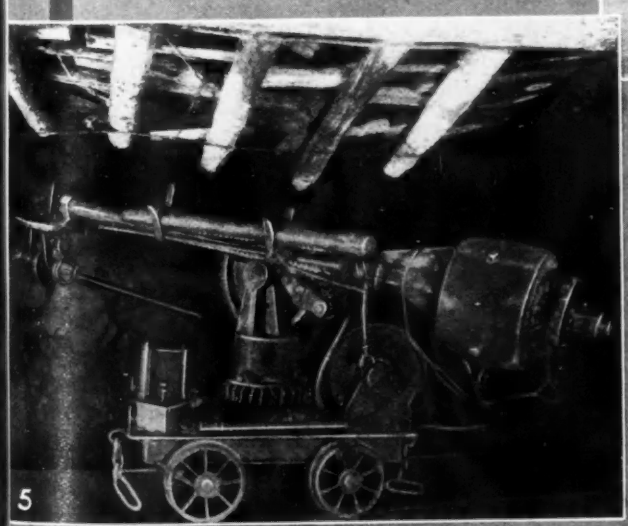
ONE aspect of the work done by the Electricity Board for Northern Ireland during its first three full years of working may be deduced from the operation statistics given in its annual report, which was reviewed in our last issue. Energy purchased from the Harbour power station of Belfast Corporation, costing 0.397d. per kWh, is transmitted to areas, hitherto without a supply or served by small generating plants. As a measure of the advantage to these localities of using the Belfast supply, the cost to the Board of running acquired stations last year (pending the extension of its high-voltage system) was 1.09d. per kWh, although their aggregate load factor was much higher than that of the main system.

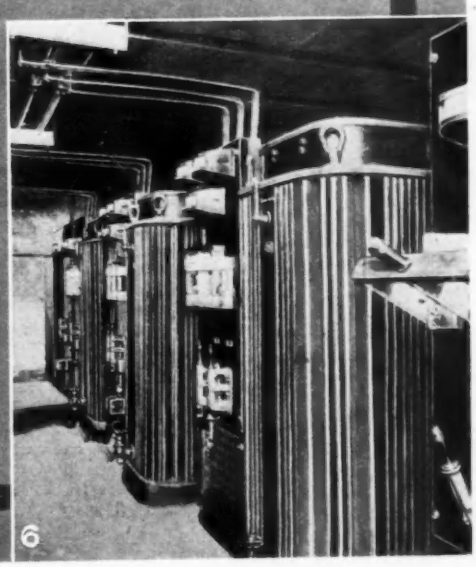












Power and Industrial Plant of Twenty-five Years Ago

1. Controlling apparatus for a double Geipel & Lange Mascord driving equipment in Messrs. Edward Lloyd's London printing works. 2. The Dundee municipal power station. 3. The east bay of the Burnley electricity works. 4. Reyrolle 10,000-V switchgear in the Catford sub-station of the South Metropolitan E.L. & P. Co. 5. A 5-h.p. motor driving a rock drill at the Loftus ironstone mines. 6. Transformers and switchgear in the sub-station of the Brunswick Textile Mills.

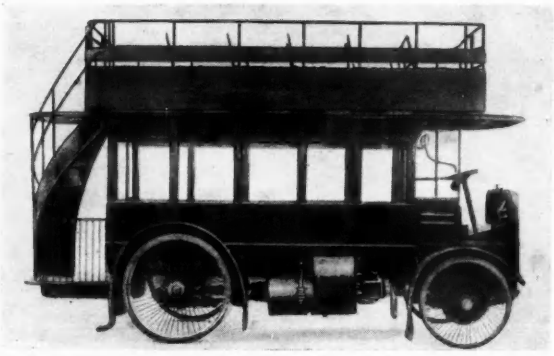
Twenty-five Years Ago

Notable happenings in the year of the King's accession

TURNING over the pages of the two ELECTRICAL REVIEW volumes for 1910, we were struck by two things. The first was how different things are now—how far we have advanced; the second was how very similar the position is now to what it was then.

This paradox is explained by the broad division of electrical matters into two parts—technical and commercial. The technical advance is self-evident in every department of the industry; even now we can see it going on almost from month to month. But except for its natural growth the state of the commercial side has remained much the same.

The year 1910 was one of great controversy between the municipal suppliers of electricity and the electrical installation contractors. The Incorporated Municipal Electrical Association was promoting a Bill to secure for municipalities the right to supply wiring and fittings. All the affiliated councils were canvassed for their support, and the president (Mr. J. Christie) and the hon. secretary (Mr. H. Faraday Proctor) went over the country appealing for financial aid in the Parliamentary battle which threatened. On the other side, the Electrical Contractors' Association, whose principal champions were Mr. G. Harland Bowden, the president, and Mr. L. G. Tate, the secretary, campaigned against the proposal, and sought funds from contractors to combat it.



The Daimler petrol-electric bus introduced in 1910

The Bill was eventually dropped, but it is worth recording that in the same year the Attorney-General, at the relation of a ratepayer, brought an action against Leicester Corporation to restrain it from supplying wiring and fittings. Mr. Justice Neville, who tried the case, ruled that the "supply" of electricity stopped short at the consumers' terminals; what happened thereafter was none of the undertaking's business. Commenting on the dispute in our issue of October 21st, we said: "It is little short of folly that the electrical industry should be engaged in squandering its resources and wasting its energies in a contest of this kind."

To-day we have in force an Act which enables all undertakings to engage in installation work and the supply of apparatus (upon conditions) and we also have a Fair Trading Council entrusted with the task of smoothing out the relations between the various interests which are affected, but still the fight goes on.

It is also interesting to read in our October 7th issue a leader on "Competition in the Electrical Industry," in which we condemned "the senseless practice of cutting prices," and urged manufacturers to get together to prevent it.

The Metal-filament Lamp

Another matter which greatly exercised the attention of the supply industry in 1910 was the question of the metal-filament lamp. In the domestic sphere very little had been done apart from lighting. The supersession of the old carbon-filament lamp by the metal-filament pattern represented a tremendous jump in efficiency and produced a very serious effect upon the revenue of the supply undertakings whose load was mainly lighting. They were forced, therefore, to look around for means of making good the deficit, and that caused a growth of interest in electric cooking and heating.

It was soon found that this kind of load brought problems in its train such as the effect upon the peak and the question of methods of charging. During the year 1910 many papers were read and many articles were contributed to our pages upon this subject. Mr. W. A. Toppin pointed out in an article in our July 1st issue that the "Norwich, telephone or annual charge system is now in use in a number of towns to meet these conditions," and the opinion was expressed at that year's British Association meeting that the question of charges was "really too vital to be settled by experts, who, too often, cannot see the wood for the trees."

The necessity for propaganda was realised by the Associated Municipal Engineers of London when they formed in 1910 the London Electricity Supply Publicity Committee, which did a good deal of useful educational work of the kind now performed by E.D.A. Allied with this was the question of "service," and it was noted in an article in our August 19th issue that "many undertakings nowadays have set up consumers' departments." Propaganda and service have greatly improved since then, but the need for more of both is still very apparent to-day.

On November 25th, 1910, we had to record the death of Mr. Gustav Byng, the energetic chairman of the General Electric Co., Ltd.

There is so much else of interest that it is possible only to refer to one or two items. Electrical trade was on the upward grade in 1910; the average monthly exports amounted to £474,000, but the figure was swollen by abnormal exports of telegraphic material. The imports had a monthly average value of £189,000. In 1934 the corresponding figures were: Exports, £942,000; imports, £296,000.

At the annual meeting of the Yorkshire Electric Power Co. in September, 1910, Mr. A. G. Lupton (chairman) said that the total receipts for the preceding six months amounted to £16,678. The company's report for 1934 recorded a total revenue of over £923,000. This is quoted as a typical example of the growth which has characterised all such undertakings.

Holborn ratepayers held a meeting to protest against the award of a ten-year street-lighting contract to the Gas Light & Coke Co. without competition. The chairman of the Manchester Gas Committee complained that the Electricity Department was "slowly murdering" the Gas Department. At Chelmsford, the chairman of the local Education Committee said that he "would never dream of putting gas into any modern school." The Electro-Harmonic Society (now defunct) was going strong in 1910 with the late Mr. T. E. Gatehouse as violinist.

And to conclude this part of our retrospect: A Wellingborough newspaper, reporting a local fire, said: "Though it cannot actually be stated as fact, it is believed the outbreak was due to the fusion of an electric wire."

Technical Progress

We will turn now to the more technical aspect of affairs in 1910. In January, the Institution of Electrical Engineers invited tenders for the interior wiring and fittings for the lighting of its new premises which were inaugurated in the following November, when the late Dr. (then Mr.) S. Z. de Ferranti delivered his presidental address which we printed in full at the time because of its outstanding importance.

Another of that year's landmarks was the Electric Lighting (Amendment) Act, which came into force on April 1st and was described at the time as being "really more of academic than practical interest."

Among other milestones was the introduction of the Home Office Regulations for Factories and Workshops in July. The extending use of electricity in mines, which had revealed many defects in the Special Rules of the Home Office, caused a Departmental Committee to suggest fresh regulations and, incidentally, led to the formation of the Institution of Mining Electrical Engineers. The present president of that Institution, Mr. H. J. Fisher, read an I.E.E. paper at Newcastle-on-Tyne in which he described "An Electrical Safety System for Use in Mines," including a gate-end box that was hailed as "really satisfactory" by Dr. W. M. Thornton (the present I.E.E. president), who suggested that if the author's system were used universally there would be no need for any of the various discussions then going on regarding the safe use of electricity in pits. Soon afterwards the Home Office officially notified changes in the organisation of colliery inspection as recommended by a Royal Commission on Mines.

The opening of the a.c. single-phase section of the old London, Brighton and South Coast Railway must not be overlooked, though our then expressed hope that "this will be followed by many other conversions from steam to electric traction on railways" has not been fully realised.

During the summer of 1910 a turbo-electric locomotive built in Glasgow was tested by the North British and Caledonian Railway Co., and a Select Committee of the House of Lords was considering the London "Tube" amalgamations. During the discussion of the Baker Street-Waterloo Railway Bill, Counsel stated that it was proposed to construct an "esculator" 120 ft. long. "The apparatus was in use in America, but they

had never been worked in connection with railway stations in England."

The conversion of horse-drawn tramway systems proceeded apace during the year. Nine contemplated tramway construction schemes for which Parliamentary sanction was being sought involved an estimated expenditure of £2,237,149, of which the L.C.C.'s £1,595,000 project was the largest and involved street widenings costing £640,000.

The "railless trolley" had been much discussed and investigated and in January, 1910, it was recorded that "at last we have a sample section, at Hendon, to show Britishers what the system is like without the necessity of enjoying a Continental holiday at the ratepayers' expense." During the year we described the Tilling-Stevens vehicle and a 12-h.p. Daimler petrol-electric omnibus incorporating Knight, Pieper and Lanchester patents.

Evidence of the prominence to which the industrial applications of electric power had attained in 1910 is afforded by the amount of space which we devoted to the subject in that year. Descriptions of mining electrical gear, the driving of printing works, and textile mill electrification filled many pages, from which we quote that ". . . the electric transmission of power in textile mills in this country is in the ascendant, and has made remarkable progress during the last few years. There are already many Lancashire and Yorkshire mills fitted out with complete electrical equipments, all of which, however, are on the group system, whereas on the Continent individual motors for each machine are now being used generally."

The A.E.G. secured an order for three 1,280-kW, three-phase, 3,000-V generating sets in connection with the electrification of the works of Dorman, Long & Co. by the utilisation of exhaust steam from the rolling mills. At Cammell, Laird & Co.'s steel works producer gas was used to drive 140- and 250-kW generating sets, the fuel consumption being slightly less than 1 lb. of coal per i.h.p.-hour and the average cost 0.32d. per kWh. Messrs. Siemens Bros.' Stafford works built a 10,000-h.p. rolling mill motor to operate at 60/90 r.p.m., 920/1,400 V d.c., and capable of reversing at the rate of thirty times a minute, in conjunction with an Ilgner motor-generator set with a 50-ton flywheel.

At that time there were in use motors of large sizes relative to the capacities of the generating plant being installed in the numerous power station extensions. For instance, Belfast installed a 1,500-kW d.c. turbo-generator, while Eccles purchased a 150-kW d.c. engine-driven set. Luton called for a 500-kW set and Wimbledon for one of 1,000 kW. Coventry had two 2,500-kW turbine sets, while Brighton accepted a 3,500-kW turbo-alternator at a price of £11,370 with a steam consumption of 14 lb. per kWh. Glasgow then had a maximum load of 21,719 kW, Hull's output was 6,346,000 kWh, and that of Leeds reached 12,421,164 kWh in 1909-10.

A quarter of a century ago Sunderland Town Council made an unsuccessful attempt to restrain a local papermaking concern from generating its own electricity, while discussion was already taking place in our pages on the relative merits of private production versus public supply.

A "high-tension" d.c. 2,750-V system was in use at Twickenham, and three-phase a.c. underground cables operating at 5,000/12,000 V were fairly common; in Durham there was 100 miles of 20,000 V cables in porcelain ducts.

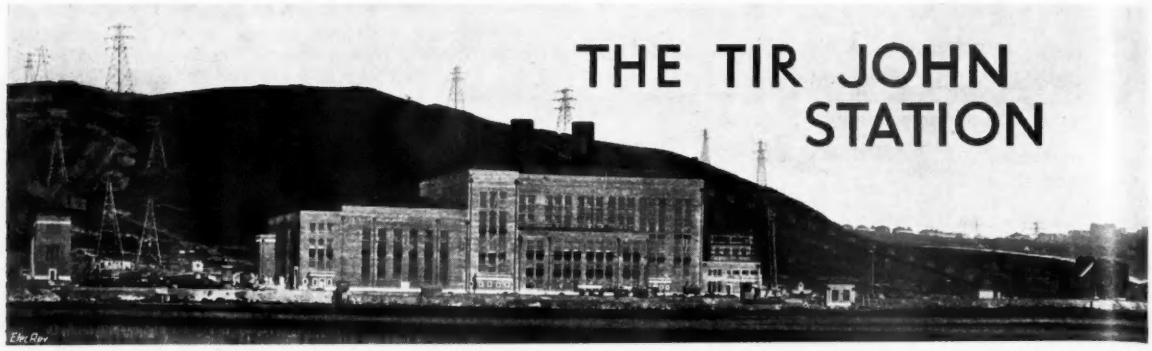
During the year Mr. J. T. Priestley reported good results from electrical (discharge) stimulation of crop growth. Mr. G. Basil Barham contributed an account of the uses of electricity on farms abroad and a 5,000-acre American farm was described as all-electric, using electrical energy for lighting, heating, cooking, and driving.

Domestic apparatus was not much in evidence then, but a Drake & Gorham vacuum cleaner was hailed as "really portable," weighing 7-10 lb., and capable of being used much like a broom. The Duncan Watson "Santo" cleaner introduced at the end of 1910 was of cylindrical form on castors. Several cookers, somewhat like the modern "baby" variety, were available (including the "Tricity" and Wilkinson models), and the heavier ones included the Marylebone cooking stove. There were also Best & Lloyd and "Verity" radiators and "Eclipse" heaters, and it is amusing to note the curious precautions considered necessary for the use of electric irons. The "Edison Swan" wall switch socket appears to be one of the earliest interlocked types.

Cinematograph regulations came into force on January 1st, 1910, and the possibility of television was said to have been demonstrated. Marconi's transatlantic wireless telephony service was opened in April and a distinct departure in submarine cable practice was marked by the laying of an Anglo-French telephone cable of the loaded type made by Siemens Bros. The National Telephone Co. then had 516,888 "stations" and 1,569 exchanges, while the first "telewriter" exchange was inaugurated that year.

What Domestic Electrical Appliances looked like Twenty-five Years Ago

1. A Georgian non-luminous radiator (Veritys). 2. A "Tricity" oven. 3. A Best & Lloyd resistance radiator. 4 and 5. Two "Therma" appliances—an iron and a kettle. 6. The "Economic" electric oven (Wilkinson & Partners). 7. An "Eclipse" heater (Elec. & Ordnance Accessories Co.). 8. The "Marylebone" electric cooker (G.E.C.).



THE TIR JOHN STATION

TIR John, the new power house of the Swansea Corporation electricity undertaking and base-load station under the C.E.B. scheme, is now nearing completion, as is shown by the accompanying "progress" photographs which have recently been taken. The building is situated three miles east of Swansea at a point where solid rock was located near the land surface. The site is adjacent to the Danycraig sidings of the Great Western Railway, from which sub-sidings will convey coal to the station, and it is near to the King's and Queen's Docks which afford practically sea water for condenser circulation.

An ultimate generating capacity of 240,000 kW is planned, and the present building is designed to accommodate 120,000 kW of plant, of which 60,000 kW is included in the initial section. The station is designed to burn anthracite duff, the finest material from the screens of local collieries, and considerable advance is hoped for in respect of operating costs.

The Main Building

Of brick and steel (6,000 tons) construction, the main building may be considered as in two sections, with the turbine room (including circulating-water pump and boiler feed pump bays at its south and north sides, respectively) at the south end and the boiler house at the north end. A separate building at the south end houses the main switchgear for the station and that belonging to the C.E.B. necessary for the interchange of supplies with the adjacent 33/132-kV grid "sub." Housing coal- and ash-handling equipment there are other separate buildings at the north end.

Cable and control rooms form upper storeys of the circulating water pump bay, and an auxiliary switchgear room is at the top of the feed water pump bay. Twenty-ton steel railway trucks will bring coal into a tippler house where the table is winch-operated from above. The fuel is to be tipped into a hopper below ground level from which it will be deposited on a belt conveyor system (two main belts each 2.5 ft. wide, 250 ft. per min., 150 tons per hour) and elevated about 125 ft. to the raw coal bunkers over the boilers. The tipplers are operated from the weigh house, where Avery machines take both gross and tare weights at the delivery and discharge sides.

Totally enclosed scraper conveyors along the top of the bunkers will distribute the coal through slide valves as required to the four 600-ton bunkers. Each main belt is driven by a 60-h.p. motor and each scraper conveyor by a 10-h.p. motor, all the motors being supplied by Lancashire Dynamo & Crypto, Ltd. These drives are effected through "Radicon" reduction gears produced by Messrs. David Brown & Co., Ltd.

Dust will be extracted from the tippler house by a motor-driven Keith Blackman fan and deposited on the belts *via* a hopper, chutes and air-filtering fabric sleeves. For coal dump storage a subsidiary conveyor system includes an elevator for conveyance from the tippler and a drag-line scraper which incorporates a two-drum winch to operate a bucket for distribution over the 20,000-ton dump *via* a stationary pulley post and pulleys on a truck which can be anchored at any point on a track around the dump.

The main conveying plant was supplied by the New Conveyor Co., Ltd., and the drag line scraper equipment by Messrs. E. F. Sargeant & Co., Ltd. From the raw-coal bunkers the fuel will be fed through weirs down to Hardinge ball mills in the basement, and in pulverised form it will pass upward, in turn, through the classifier cyclones, Fuller Kenyon pumps, and to the pulverised fuel bunkers (100 tons).

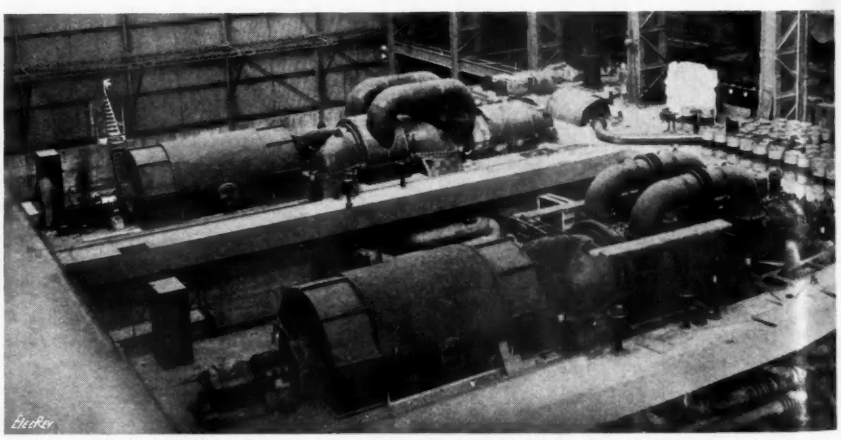
Powdered fuel from each bunker will be gravity fed to the boiler burner feeders, each of which is equipped with a motor driven disc regulating device. There are twelve burners per boiler, and a single feeder is common to each pair of burners. Fuel will be fed into the boilers at 50 ft. per second, firing being effected on the "Lopulco" system, thorough mixing of the coal and air being a particular feature of the burner construction.

Primary air for propelling the coal is to be pumped into the feeders of each boiler at 700 deg. F. by a 120-h.p. motor-driven fan, the air being drawn from a plate-type air heater placed at the back of the boiler and served by the exhaust gases.

Four boilers are at present installed. They are of the three-drum type, each with an ordinary heating surface of 14,080 sq. ft. and a superheater surface of 6,700 sq. ft. Each boiler has an output of 240,000 lb. of steam per hour at 625 lb. per sq. in., and 850 deg. F. The combustion chambers have water-cooled walls and a volume each of 12,400 cu. ft. A normal consumption of 10 tons of coal per hour per boiler is expected.

Gas Washing Equipments

At a level a little below the tops of the raw coal bunkers gas washing equipments are being installed by Messrs. James Howden & Co., Ltd., in which the flue contents will be treated in lime-laden water before being discharged to the stacks and atmosphere. There is one stack per pair of boilers and they are 20 ft. in diameter and 60 ft. high from the top of the building. In each case the i.d. fan is placed between the washer and stack, the f.d. fan being fitted between the post economiser air heater and the gas washer.



The turbine room with two 30,000-kW sets

At the front of the boiler equipment the major components are placed from the basement upwards in the following order: Ball mill, ash hopper, cyclone, pulverised fuel pump, p.f. bunker, primary air fan and fuel feeder to boiler. At the back of the boiler there are the sooting hopper, pre-economiser air heater, economiser, post economiser air heater, f.d. fan, gas washer and i.d. fan. For starting purposes only each boiler is equipped for oil firing, and at the time of our visit there was one boiler under steam by oil. Ashes will be first removed by a drag-link conveyor and subsequently crushed, deposited in a swirl pit and pumped out to a dump.

The Bailey system of automatic firing control is to be installed by Messrs. Allen West & Co., Ltd. Between the boiler and turbine stop valves are steam receivers supplied by Messrs. Aiton, Ltd.

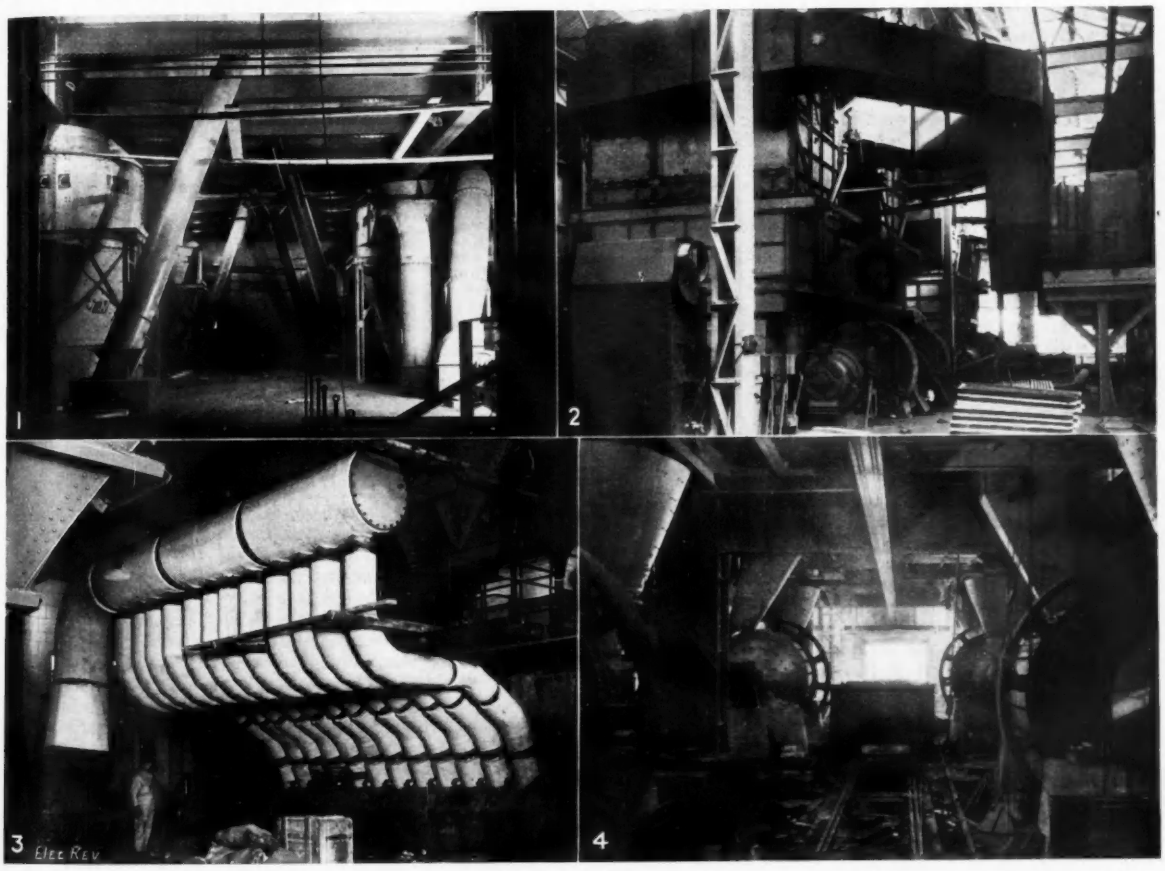
Two 30,000-kW (0.8 p.f.) turbo-alternators have been installed by Messrs. C. A. Parsons & Co., Ltd. Each turbine is a two-cylinder machine of the pure reaction type, and the stop-valve steam conditions are 600 lb. per sq. in and 825 deg. F. The turbines are bled at the h.p., i.p., and l.p. stages for serving feed-water pre-heaters which, with the de-aerator, are also of Parsons productions, while the ejector and evaporator of each set are of Weir & Vickers-Armstrong manufacture, respectively.

There are four sets of normal feed-water pumping equipment, each consisting of a 300,000-lb. per hr. lift pump in series with another main pump of the same capacity. The lift pump in each case delivers water from the de-aerator to the feed-water pre-heater and then to the main pump. All these eight pumps are electrically driven by "Emcol" motors supplied by Messrs. Laurence, Scott & Electromotors, Ltd., the pumps being supplied by Messrs. G. & J. Weir, Ltd., who or to the adjacent C.E.B. sub-station. The only transformer for operating at the generating pressure is one which will serve the auxiliaries at 6,600 V. The alternators are cooled on the enclosed air circuit water-cooled system. The control gear is to be supplied by Messrs. Ferguson, Pailin, Ltd.

Gas-washing Plant

We were a little surprised at first to see gas-washing plant in the station, for it is in an area thick with collieries and other industrial works usually associated with smoke, although unfortunately they are not all operating

Some of the finest work in the station is on the civil engineering side, especially that associated with the constructional stages. The concrete-lined tunnels in the rock to and from the King's and Queen's Docks are an outstanding feature, and a point of particular interest relates to the sinking of a shaft at the Dock end. Boggy land was encountered,



1. Classifier cyclones. 2. Gas-washing and fan equipment. 3. Primary air fan and burners of one 240,000 lb. per hour boiler. 4. Pulverised fuel ball mills

were also responsible for a steam turbine-driven pumping set of 600,000 lb. per hr. for stand-by.

Each turbine has a Vickers-Armstrong 30,000-sq. ft. surface condenser designed to deal with 21,000 gallons of cooling water per minute. Circulating-water pumps of the same make and capable of delivering 11,000 gal. per min. are driven by B.T.H. motors. Drysdale pumps are installed for condensate extraction.

The circulating wated is conveyed to site from King's Dock, a distance of 900 yd., by shafts and tunnels in the rock and discharged in similar fashion to Queen's Dock, which is 1,200 yd. from the station. The shafts and tunnels are concrete lined, the shafts being 14 ft. and the tunnels 9 ft. in diameter. There are two concrete channels on site from which the circulating water pumps lift the cooling water direct, and the flow to and from these and the docks will be natural.

Delivery to the circulating pumps is governed by electrically operated penstocks served by Metropolitan-Vickers motors. The condensate is to be weighed in special tanks supported by an ingenious arrangement of levers connected up with an Avery arm-type weigher.

A Simple System

The electrical system as a whole is unusually simple. The alternators generate at 33 kV, at which pressure the energy is conveyed to the vertical isolation round-tank duplicate bus-bar switchboard supplied by Messrs. Ferguson, Pailin, Ltd., and straight out either to the undertaking's Swansea feeders and this was frozen hard by brine circulation, thus facilitating the digging operations.

On the electrical side some good constructional work is represented by the very steep climbs of the outgoing overhead lines up the adjacent hillside. This also applies to the C.E.B. lines from the adjacent grid sub-station.

The only 33-kV transformer on site, not including the grid equipment, of course, is one supplied by Hackbridge Electric Construction Co., Ltd. This is unusual in that the cooling tubes are arranged as a separate bank from the transformer proper which also incorporates voltage regulating equipment. This transformer is intended for supplying the station auxiliaries, and it can be fed directly from the C.E.B. sub-station. The main switchgear has been on circuit for some time for a supply from the grid sub-station to the undertaking's Swansea feeders.

Tir John will be for the present an addition to the 110 generating stations (Electricity Commissioners' Returns, 1934) in the South-West England and South Wales area, and it is interesting to compare this number with the twenty-five stations in the N.E. England area and the forty stations in the Mid-East England area. But the S.W. England scheme was one of the last to be put into operation.

We are indebted to Mr. J. W. Burr, borough electrical engineer, Swansea, for permission to visit the station which was designed by and is being erected under the supervision of Messrs. Preece, Cardew & Rider, consulting engineers to the Corporation.

Coal-face Machinery. By G. Barnard, A.M.I.E.E.*

Safety and efficiency

MOST colliery electrical engineers agree that remote control of coal-face electrical machinery is the best method so far adopted from the points of view of safety, convenience and efficiency, though the system and its advantages are not always fully understood.

For connecting a coal-cutter (fig. 1) the main armoured cable enters the flame-proof gate-end switch at A and goes to an isolating switch IS. On the load side of the isolator tappings are taken to a potential transformer PT which gives a voltage of usually not more than 24 V to the pilot circuit.

The system requires a five-core trailing cable consisting of three phase cores, one thick earth core, and one pilot core. Standard flame-proof plugs are provided at each end of the trailing cable. There are four sockets in each plug which engage with pins on the gate-end switch and cutter. The pilot socket and pin are shorter than the main power ones in order to ensure that the main power connections are properly made *before* the pilot circuit, and also that when withdrawing the trailing cable the main power circuit plug connections are broken *after* the pilot circuit.

When the coal-cutter is started all the plug connections must be absolutely "home" before the gear can operate. The auxiliary switch on the cutter (sometimes a push-button of special design is used) is then moved to the "start" position. If the earth circuit is properly continuous and the pilot earth circuit is at the required low resistance value, the operating relay OR is energised sufficiently to close the contactor circuit in the gate-end switch and power is applied to the main cores.

On being released the auxiliary switch handle springs back to the "run" position, and a definite amount of resistance R is inserted in the pilot circuit, thereby limiting the current to a value sufficient to retain the operating-relay armature in the "on" position, but insufficient to pull it into position if it were to drop out due to a fault in the system.

Safety Features

Risk of open-sparking is reduced to the minimum; the making and breaking of power current takes place in the flame-proof gate-end switch. The trailing cable is always "dead" when the cutter is not actually working and it is impossible to make the plug pins "live" with the trailing cable removed. The change-over switch in the cutter is so interlocked that it must be in one position or the other before the attendant can work the auxiliary switch. In other designs change of direction is effected at the isolating switch in the gate-end switch. Explosion hazards are reduced, and the

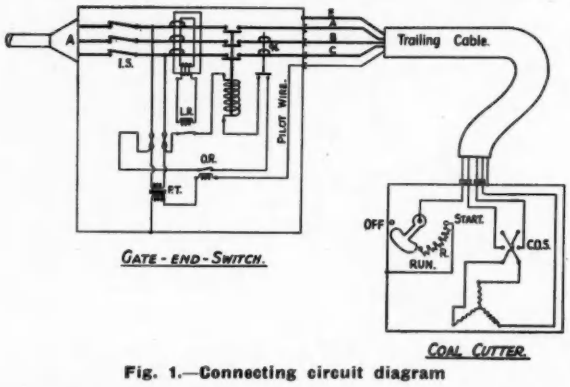


Fig. 1.—Connecting circuit diagram

apparatus can also be thoroughly recommended as a safeguard against electric shock, due to the fact that any leakage has always an excellent low resistance path to earth.

Most colliery a.c. systems operate with an earthed neutral, which allows the use of core-balance leakage protection. In fig. 1 this form of protection is included, so that the trailing cable and machine are made "dead" immediately any leakage to earth occurs. Some engineers prefer the core-balance leakage trip to be situated at a feeder switch farther outbye, but this is a question which is decided on site after taking into account the distribution arrangements.

A weakness is that if the pilot-core short-circuits with the earth-core the gear may start automatically. Trailing cables are undoubtedly the weakest link in the whole of the electrical chain underground, but they are vastly superior to what they were several years ago. Furthermore, additional safeguards are incorporated in gate-end switches of modern manufacture to take care of pilot-circuit faults of this kind, though the weakness has now been definitely overcome.

In a recent design two half-wave metal rectifiers are used; one is placed at the machine auxiliary switch and the other in the gate-end switch. They are connected in opposition in series with a protective relay. Under normal balanced conditions no current passes through the relay. A fault on the pilot-core destroys the balance and the resultant current through the relay opens the main contactor.

Trailing Cables

It is not universally agreed, but the majority of responsible colliery electricians are satisfied that the trailing cable which,

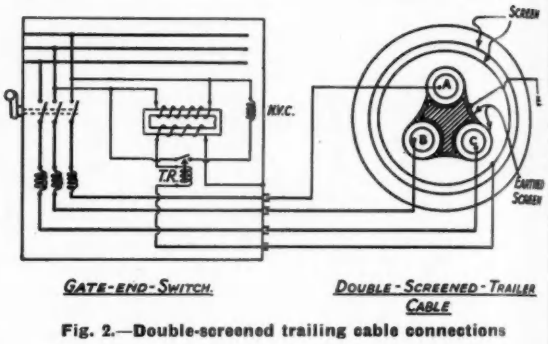


Fig. 2.—Double-screened trailing cable connections

in addition to rubber insulation and tough-rubber sheathing, has an earthed metal screen (usually "Ferflex") surrounding the power cores is the safest kind to use. Trailing cables are subjected to rough treatment. When the metal-screened trailer receives a blow the metal sheathing must take the force first, and as soon as it makes contact with any "live" core the gate-end switch operates if the leakage trip is properly adjusted. Open sparking is thus reduced to a remote risk, and there is little danger to life.

A more expensive trailing cable has been used with excellent results. This has two concentric metallic screens around the cores and is called a double-screened trailing cable (fig. 2). With the addition of a pilot core, the same kind of cable can be used for remote control systems. The inner of the two screens is kept at a potential slightly above earth, while the outer screen is earthed. Usually the screen system is operated at 6-V, the current being limited to approximately $\frac{1}{10}$ A. The two screens are separated by a thin layer of insulation, and there is no circuit through the trip-relay TR unless the screens make contact with each other. If this cable is mechanically damaged while power is on all cores the main circuit-breaker will be opened before damage by burning taking place at the cores. Tests have been made by deliberately chopping through the cable with a sharp axe while the cores carried full current without the slightest sign of sparks or burning.

Gate-end Switchboards

Gate-end switchboards are now in regular use. They consist of several remotely controlled flame-proof panels joined together. Each panel is made so that it can be readily disconnected and withdrawn from the pit. An isolating switch is provided on each panel so that the separate control gear can be maintained and tested without cutting off the voltage from the remainder of the switchboard units.

By using these switchboards a convenient form of control is established whereby local operation of auxiliary switches (or push-buttons) on cutters, conveyors, coal drills and loaders can be easily effected. The whole arrangement is flexible and safe. It has the blessing of the Mines Department provided, of course, that the apparatus is properly maintained and adequately inspected.

A Standards Institution for South Africa

It has been decided to form, under the auspices of the Union Government, a national standardising body to be known as the South African Standards Institution. The movement was started in 1909 as the South African Standards Committee, and in 1919 it became a branch of the then British Engineering Standards Association. Professor John Orr, O.B.E., head of the Johannesburg Technical College, is the chairman of the new Institution.

---

*Mr. Barnard is a member of the Association of Mining Electrical Engineers, and lectures at the Manchester College of Technology.

Design and Performance. By E. T. Norris, M.I.E.E.

An application of the theory of probability

DISCREPANCIES between the calculated performance of machinery and apparatus and the corresponding measured or actual values are due either to errors in design and construction—referred to as consistent errors—or to variations and irregularities in the manufacturing processes. The latter are distinct from the former in that they follow the vagaries of chance.

Since consistent error is, in most cases, avoidable, efficient production is largely dependent on the correct treatment of the unavoidable variations. The effect of these on the performance, as measured on test, is studied with the aid of the theory of probability. A method of applying this theory to practical cases is developed in such a way as to permit determination of the best guaranteed values, taking into account manufacturing and trading conditions; the variability of the materials and processes employed; and the amount of tolerance allowed (if any).

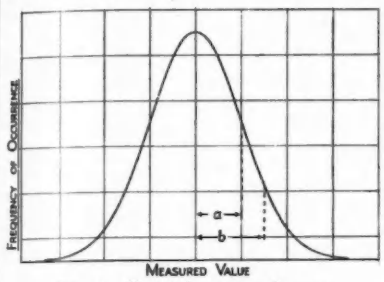


Fig. 1.—Normal curve of error

In addition to substituting a logical and reasonable analysis of the problem for guesswork, more or less blind, the method gives the following advantages:—

(1) The manufacturer can determine the best value to guarantee for any given characteristic, knowing the risk that he runs in giving that guarantee and the likelihood of his not meeting it (which is not necessarily the same thing).

(2) He can see exactly what benefit a tolerance will be to him in any particular case, and how it should influence his guarantee. Under certain conditions a tolerance is of great help to the manufacturer, but under other conditions it is of no use, since purchasers nearly always prefer rigid guarantees; the manufacturer can in such cases forgo the tolerance.

(3) The effect of variations in manufacture is clearly shown. The cost and difficulty of reducing shops allowances and of improving accuracy of construction can then be balanced against the resulting technical improvement.

(4) In a similar way the effect of variations in the quality of the materials used is shown up, and the desirability of increasing the rigidity of purchasing specifications for raw materials can be determined.

(5) When the raw material received can be put through grading processes, the cases in which it is desirable to do this are demonstrated.

(6) Where a material of apparently better quality is available, the exact value of this improved quality to the manufacturer is indicated and balanced, if necessary, against any variation in consistency.

(7) Unexpected test results can be ascribed either to a combination of errors and variations in manufacture and assembly, or to some more consistent cause, such as an error in design or manufacturing process.

Theoretical Principle

The theory of probability is that if certain measurements and test values are subject to chance variations due to a number of uncontrollable elemental causes, each of which is equally likely to be positive or negative, and such that large errors are less likely to occur than small errors and that very large errors will not occur, the frequency of occurrence of any particular measured value and its deviation from the mean value are related by the "normal curve of error" shown in Fig. 1. This is also termed the probability curve.

It is usual, where the measured values do not occur in steps or in whole numbers, to scale the abscissa in suitable cells or class intervals, the ordinates being the number of measured values in each particular class interval.

Important characteristics of the normal curve are the mean value, as shown by the maximum ordinate, and the standard deviation σ. The standard deviation indicates the dispersion of the values on each side of the average and is a measure of the variability of the readings. It is algebraically the square root of the mean of the squares of the deviations from the average value. Numerically it is that variation from the mean value within which lie 68 per cent. of the measured values. The greater the precision with which a characteristic can be calculated, the smaller the standard deviation, and σ is thus an important factor in the predetermination of performance. It is commonly expressed as a percentage of the arithmetic mean.

A more readily understandable term expressing variability is the "probable error." This is numerically equal to 0.675σ and is such that it is an even chance that any single measured value will be within that variation from the mean. In an example given later of loss measurements, the standard deviation is 5.8 per cent. and the probable error, therefore, 3.9 per cent. The chances are even that any particular test result will be within 3.9 per cent. of the calculated value.

As a practical example no-load loss measurements on a line of three-phase power transformers of ratings between 20 and 100 kVA will be analysed. The no-load loss of a transformer as measured on test is subject to variations due to a number of elemental causes—differences in the electrical quality (*i.e.*, the watts/loss per lb. factor), in the thickness, in the scale formation and in the insulation of the individual laminations forming the magnetic core; variations in the quantity of iron in the completed core; irregularities in the accuracy of core assembly and in the goodness of the magnetic joints.

The data as obtained from test measurements on 336 transformers are shown in lines (1) and (2) of Table I, (1) being the ratio of measured value to calculated value of no-load loss, and (2) the number of test results in each class interval. When (due to differences in size or other characteristic of the objects under test) the measured values are not directly comparable, they must be expressed in terms of some standard reference, such as the ideal value or the values calculated from a standard formula or curve. In this case the chief variations are size and flux density and the measured values are, therefore, expressed in terms of the values calculated from a standard loss curve connecting flux density and watts loss per pound of iron used in the construction.

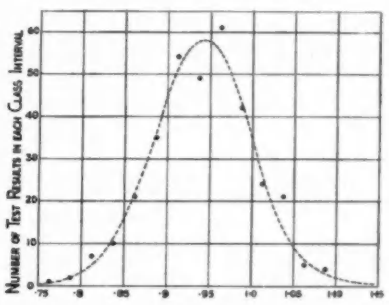


Fig. 2.—Measured values of no-load loss

If the test results are plotted to show the relation between lines (1) and (2) of the table, a normal curve of error as shown in Fig. 2 is obtained. The dotted line here shows the theoretical probability curve having constants fitting most closely the measured values. Although the mean value and standard deviation may readily be obtained from this curve, its significance is not very obvious to the non-mathematical mind, nor is it easy to make practical comparisons between curves of different shapes.

A much more convenient method of plotting the results, for the present purpose, developed by Mr. Allen Hazen*, is illustrated in Fig. 3. A specially scaled graph paper is used in which the rulings of the ordinates are spaced in accordance with the normal law of error. The abscissa scale is linear so that data following the normal law will form a straight line when plotted cumulatively on such paper. The ordinates are, therefore, scaled in percentage of results within a certain measured value as indicated by the abscissa. For this purpose

TABLE I.

(1) Ratio measured value/calculated value of no-load loss	0.75	0.775	0.80	0.825	0.85	0.875	0.90	0.925	0.95	0.975	1.00	1.025	1.05	1.075	1.10
(2) No. of test results in each class interval	1	2	7	10	21	35	54	49	61	42	24	21	5	4	
(3) Total no. of test results below the corresponding ratio value shown in column (1) ...	1	3	10	20	41	76	130	179	240	282	306	327	332	336	
(4) Percentage of results below the corresponding ratio value shown in column (1) ...	0.298	0.804	2.98	5.96	12.2	22.6	38.7	53.5	71.5	84	91.1	97.3	98.8	100	

* "Storage to be provided in Impounding Reservoirs for Municipal Water Supplies," Trans. A.S.C.E., 1914, Vol. LXXVII, p. 1539.

lines (3) and (4) have been added to table I; (3) gives the total number of test results below the value shown in (1) and (4) the same number expressed as a percentage of the total number of tests. Fig. 3 shows that the points thus obtained fall very nearly on a straight line. This in itself is an indication that the variations in the measured values are due mainly to chance and not to some consistent cause such as error in design or measurement. Much other important information is also evident from the curve. The average value of test result, being that value having 50 per cent. of the measured values above or below it, is given directly by the abscissa reading corresponding to 50 per cent. ordinate value. Change in the mean value is, therefore, indicated by horizontal displacement of the curve.

The variability of the results (*i.e.*, probable error or standard deviation) is proportional to the slope of the line. If there were no variation at all the line would be vertical at the mean value. Since 34 per cent. of the results lie between the mean and the value corresponding to the standard deviation, 16 per cent. of the results will lie below this value. If, therefore, horizontal lines (a) and (b) are drawn on the chart at positions corresponding to ordinate values of 16 per cent. and 84 per cent. the standard deviation will be the difference in the measured values corresponding to the mean and either of the points at which the curve cuts the lines (a) and (b). (It can, therefore, be read directly from the chart.)

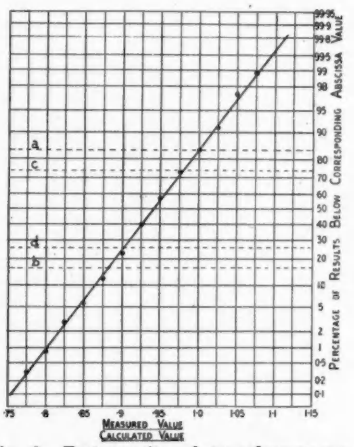


Fig. 3.—Test results of transformer no-load losses plotted on probability paper

In a similar manner horizontal lines (c) and (d) drawn at ordinate values of 25 per cent. and 75 per cent. enable the probable error to be read directly from the chart. In the example we are considering, the mean value (corresponding to the 50 per cent. ordinate on the chart) is 0.942 and the standard deviation from the horizontal lines (a) and (b) is 0.942–0.884=1.00–0.942=0.058 or 5.8 per cent.

Practical Application

To illustrate the method of arriving at the best guaranteed value, assume that a tolerance of 10 per cent. is allowed (this is the standard figure for transformer no-load loss in accordance with B.S.S. No. 171—1927), and that the manufacturer does not wish more than one test result in twenty-five (*i.e.*, 4 per cent.) to exceed the tolerance limit. Fig. 3 shows that 96 per cent of the measured values will be below 1.045. In order that these shall all be within the tolerance limit the guaranteed value must be not more than $1.045 \pm 1.10 = 0.952$ times the value calculated from the standard formula. The chart also shows that on this basis 44 per cent. of the measurements will be greater than the guaranteed value, but only 4 per cent. will cause trouble by exceeding the tolerance limit.

The particular case just described of transformer no-load loss measurements was one of a series of analyses covering a wide range of power transformer construction. The results led first to the segregation of certain types with individual treatment as in fig. 3 and the determination of appropriate guarantee conditions; and secondly, to the development of a means of routine grading of magnetic sheets.

For the range of transformers mentioned a net reduction of 15 per cent. in the guaranteed no-load loss basis has resulted from the application of this method of analysis without increasing the risk of rejection and notwithstanding the economic use of a material of higher average loss factor. This improvement may equally well be utilised in reducing the cost of the transformer instead of the no-load loss guarantee. The equivalent price reduction is approximately 7.0 per cent.

If a means of selecting the material is available, considerable improvement is possible where the standard deviation is high and where the variation in the measured value is largely due to variations in the quality of the material in question. For example, if the standard deviation is 15 per cent. and one in a hundred results is outside the tolerance limit, a grading process eliminating 10 per cent. of the worst cases would permit a reduction of 12½ per cent. in the guaranteed value and in addition there would be no rejections.

Elimination of instances of bad workmanship by inspection during manufacture also comes under this heading. Appreciable improvement due to selection or rejection is only possible where most of the variable factors or alternatively the predominating ones, if any, are subjected to the grading process.

Water Heating for Contractors. By J. Russell Hickmott

THE large increase in the number of water-heating installations carried out during the past twelve months proves that there is a definite demand for this type of apparatus. Up to the present most of the work has been done by the supply authorities' own staffs, the business being obtained, in many cases, by remarkably low hire and hire-purchase terms. While contractors cannot offer terms such as these, their co-operation is welcomed by many of the supply authorities, who sometimes pay commission on business obtained and give the contractors responsible the order for carrying it out.

With the increase in sales the price of water heaters has fallen to a figure sufficiently low to make cash sales possible. This is an opportunity for the electrical contractor to increase his business, and he will find, generally speaking, that his existing tools are sufficient for the purpose. If canvassers or salesmen are employed the business should be easily obtained. Any customers who are not prepared to pay cash can be handed over to the supply authority.

In converting an existing hot-water system any faults in the lay-out of the pipework must be rectified at the outset. The most common fault is an incorrectly connected kitchen tap, which will sometimes be found to have been connected to the boiler-flow pipe instead of the top of the tank. The same may apply to the other taps, but this is rare.

The proper pipe connections to either a "behind-the-grate" boiler or a boiler of the "Ideal" type are as follows: The two pipes from the boiler should be taken absolutely clear to the tank, one to the top and the other to the bottom. From the top of the tank a pipe feeds all the taps. Into the bottom of the tank the cold water enters. The expansion pipe, which enters the top of the tank, rises to a position above the cold-water tank, and is so arranged that any expansion water will fall into the cold tank. Sometimes the pipe feeding the taps is teed into the expansion pipe; this is quite in order as the expansion pipe is connected to the top of the tank.

Where the taps are situated more than thirty feet from the tank conversion should not be attempted unless the pipe feeding the taps can be effectively lagged. Thirty feet of steam barrel contain approximately one gallon of water, and the whole pipe has to be filled before hot water can be obtained at the tap. It is useless attempting the conversion of a hot-water system if the capacity of the tank is below twenty gallons. In some parts of the country ten-gallon copper cylinders are used; these should be left severely alone if trouble is to be avoided.

In a modern house the hot-water tank is usually a good fit at the bottom of the linen cupboard. Unless at least three inches of insulating material can be put round the tank, hand control by a three-heat switch will prove more economical than thermostatic control alone. The consumer should be advised beforehand that he will not have as much heat in the linen cupboard when a tank has been lagged.

The running cost varies greatly with the quantity of water used. To give an accurate estimate is difficult, but salesmen will find the figures given by E.D.A. reliable, if somewhat on the high side. For an average installation supplying three taps the figure is 60 to 80 kWh per week.

Self-contained Storage Heaters

The installation of the self-contained storage heater usually consists chiefly of plumbing. The pipes can be of copper, and the necessity of wiping joints is obviated. Many fittings are obtainable which produce a neat and effective job.

There are three types of storage heaters available, and each is designed for a specific purpose. The choice between them depends chiefly upon the source of the cold water. If it is direct from the water main, and more than one position has to be supplied, the cistern-type heater (which incorporates a small ball-valve cistern at the top of the heating chamber) is indicated. Where only one position is to be supplied with hot water, and the cold supply is from the main, the push-through type may be used.

The third type of heater is the semi-pressure type, which is intended for use where the cold water is supplied from a ball-valve cistern. This type may be inserted in series with the existing hot-water tank or it can replace it. Where an immersion heater cannot be conveniently installed the use of the semi-pressure heater should be considered.

Electrical Sewage Pumping at Barking

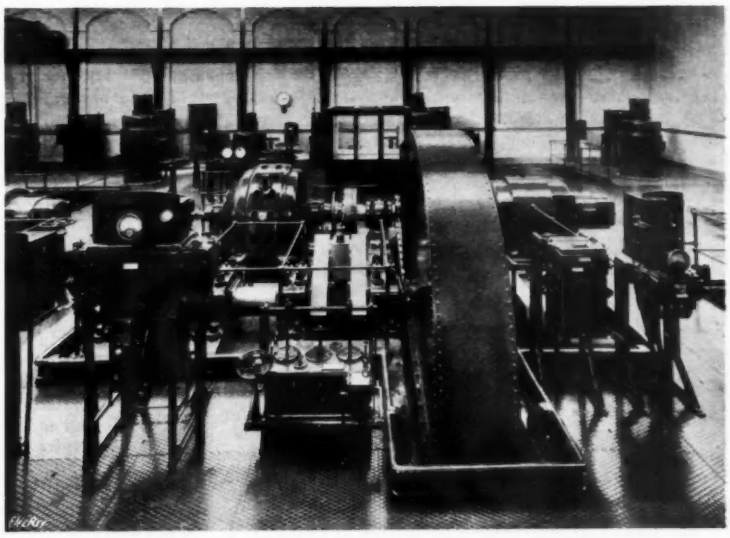
FOR its new pumping station at Gascoigne Road, Barking, opened on April 6th, the Ilford and Barking Joint Sewage Board obtains a dual supply of three-phase 50-cycle power from the Barking undertaking and from the private power house of the pumping station, which is equipped with Paxman-Crompton Diesel-generating sets.

The Barking supply is brought in at high voltage, transformed down to 400 V and fed into an 8-unit Crompton "Klad" switchboard, the 400-V supply from the alternator bus-bars being brought to the end of the l.v. board. Isolating change-over units are provided in the "Klad" board design, which equipment is housed in an integral bus-bar chamber immediately above the main circuit board. The change-over can be effected in a few minutes. From the 8-unit board the p.i.l.c. cables feed to the starter switch-contactor equipment.

There are 1,990 h.p. of pumping and auxiliary motors, comprising two dual motor units driving Tangye reciprocating pumping sets. Each set consists of one 305-h.p. and one 69-h.p. Crompton auto-synchronous motors driving on to a common double helical gear which, in turn, drives a three-throw double-acting vertical reciprocating pump crankshaft. For heavy duty the large motor is used, and for light duty the smaller. At each end of the fast motor shaft of the double helical gear there is a Tangye patent adjustable mechanically operated pin-type flexible coupling which enables either motor to be disconnected at will.

The motors and gear are erected on a combination cast-iron bedplate which, in turn, is erected on the sillplate of the reciprocating pump frame. The barrels of the pumps are about 20 ft. below the main pump-house level. Control gear of the liquid motor-starter type is used. It is hand-operated, with the exciter control pillars erected alongside the main control gear.

All the other pumps in the station are driven by Crompton Parkinson vertical-spindle auto-synchronous motors provided with Michell thrust bearings. They total 1,035 h.p., as follows: One of 175 b.h.p.; two of 300 b.h.p.; and two of 130 b.h.p. All operate at unity power factor, except the 175-b.h.p. machine, which operates at 0.8 leading. The control for these sets is by automatic contactor panels erected alongside the machines and actuated by float switches in a special switchroom and operated by float movements in sump pits adjoining the intake pipes.



Our photograph of the Ilford and Barking Joint Sewage Board's new pumping station shows dual motor sets driving a reciprocating pump in the foreground and vertical auto-synchronous motors in the background.

The Contracts Department of Crompton Parkinson, Ltd., was responsible for the cable throughout the station and for the supply and erection of the whole of the switchgear and motors.

Pole Mounting Circuit-breakers

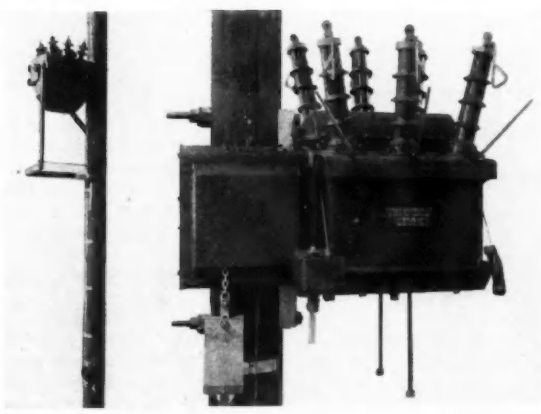
IN order to meet the ever-growing demand created by developments in rural electrification Messrs. Ferguson, Pailin, Ltd., have designed a new range of oil circuit-breakers specially for outdoor pole mounting.

The "PR1" has series trip overload protection, while the "PR2" has current transformer-operated overload and earth leakage protection. Both can be supplied with or without auto-reclose mechanism, and a variety of terminal arrangements can be provided for mounting either on a single or an "H" type pole. No castings are used in the construction, all the parts being of welded steel, and the auto-reclose mechanism parts are made from non-corroding cr "Staybrite" steel.

The standard design is available for up to 150 A at 11 kV and a rupturing capacity of 50,000 kVA. The insulation margin is about 40 per cent. greater than the requirements of the British Standards Institution. For the 11-kV switch the insulation characteristics are dry flashover value 75 kV, wet flashover value 53 kV, and puncture value 130 kV.

Inspection of the "PR1" design is facilitated by dropping the tanks by means of light, cheap portable tackle. The tank runs on wheels in light channel framework, and the moving contacts come away with the tank, and can be swung clear of it without dismantling, permitting easy access to both fixed and moving contacts. In the "PR2" type a simple handle tank lowering gear is provided. Operation from ground level is by means of an endless chain driving a pulley on the circuit-breaker, and an extension hand trip handle. The "on" and "off" positions of the switch are clearly visible from ground level and gauges enable the oil level to be checked through binoculars from ground level.

The mechanical automatic reclosing mechanism does not require an auxiliary source of power; the energy is obtained by means of a falling weight, so that the number of reclosures obtained depends on the length of the operating chain and height from the ground. When the weight finally reaches the bottom position the breaker is locked out until it is visited, and the mechanism is reset by restoring the weight to its initial position. The time interval between the tripping of the breaker on fault and its reclosure can be predetermined by settings adjustable between 0 and 30 seconds. If required, a simple mechanical device can be fitted on the "PR2" design to lock out the circuit-breaker if it trips immediately after the first reclosure.



Left: A general view of the "PR1" circuit-breaker in position. Right: A "close-up" of a "PR2" breaker showing the auto-reclose mechanism

The contacts have a butt-rolling action, making and breaking the circuit on the toe and carrying current on the heel when in the closed position.

In the "PR1" breaker automatic tripping is obtained by series overload trip coils, and oil dashpot time-lags are fitted if required. Automatic tripping of the "PR2" breaker is effected by wound primary type current transformers mounted in a separate oil-filled chamber operating overload and/or earth leakage trip coils. Delayed action is achieved by a simple mechanical escapement; alternatively, an inverse feature can be given by time-limit fuses or inverse time relays connected across the trip coils. Discriminative reverse power protection entails the use of a separate oil-filled potential transformer mounted in a separate chamber with a reverse power relay.

American Power Trusts. By Walter M. Russell

The movement for Government control of utilities

THE Americans, with their characteristic disregard of time, passion for "bigness," and huge financial resources, have in the short space of one generation created a public utility empire, now threatened with curtailment, dismemberment and death. Unlike Great Britain, the utility companies of the United States are generally privately owned. There are no large, important cities where the supply of gas is a municipal undertaking, and the metropolitan centres where the electricity supply is publicly owned are very few.

For the first century in the history of the gas business in the United States practically all the companies supplying the towns and cities were locally owned. This was also true of electricity supply companies from 1875 to 1900. Not many years before the turn of the century the thought of combination entered the minds of some enterprising men in the gas business in Philadelphia, resulting in the forming of the United Gas Improvement Company, and a little later this idea took root in New York, and other combinations followed, of both gas and electrical properties, by such interests as the American Light & Traction Co. and the North American Co.

These companies were formed for the primary purpose of owning a controlling interest in the shares of operating public utility companies, and rarely carried on any operations under their own name. It is undeniable that great economies have been effected in operation, purchasing, construction and financing by combination under one executive, engineering and banking control.

In the beginning these holding companies existed merely as a legal device for the concentration of corporate control, but as the system slowly evolved fertile minds applied themselves to methods of management that in time gave rise to abuses. The mere vastness of these combinations has come to be a challenge to those agencies of local and national government which have been devised in attempts to control them. There are at least four holding corporations, each with consolidated assets valued at more than a billion dollars. In addition, there is a financing and management company which, by means of service contracts, exerts domination over a group of holding companies having a combined asset value of more than three and a half billion dollars. There has probably been nothing in the financial world to approach this for sheer concentration of power.

Avoidance of Control

Nearly every State in the Union has a commission charged with the duty of regulating operating public utilities. The rates, quality and conditions of service are all subject to review and control. In some States the financing of operating utilities is supervised and controlled. The holding company, on the other hand, seems to have escaped regulation and control, partly for legal reasons, due to the Inter-State Commerce character of holding companies' activities in two or more States, and partly for more obscure reasons. The fact remains that, in a large sense, holding companies have been singularly free from interference or control. And with size and power have come, in some cases, arrogance and greed, leading to undesirable practices which have brought down a veritable storm of public and political denunciation, culminating in a final determined Administration-Congressional programme which bids fair to go far beyond mere regulation and to end in utter destruction.

That the dismemberment of these vast financial structures will bring serious loss to hundreds of thousands of innocent investors seems not to weigh against the political prestige hopefully sought by these modern crusaders. It must be admitted that some regulation of holding companies is a real and serious need. Above or immune from State law, and being without Federal supervision, the management of many holding companies, recognising the vulnerability of their position, are favouring and sponsoring some form of national control.

Group ownership offered opportunities for profits to be derived from construction contracts, engineering and management fees, financing charges, purchasing contracts, tax evasions, and the like. Originally it may have been, and undoubtedly was, in most cases the definite plan to provide all services of management at cost, passing on the economies derived to the consumers in the form of lower rates and to the stockholders in larger dividends.

As time went on, due to pressure from banking interests on one side and to regulatory statutes directed toward the operating companies on the other side, holding companies employed separate organisations, created by the management for the purpose, which, acting as management and construction companies, drew off a large portion of the profits of the operating companies, increasing their costs of service and construction. By revaluing all of the underlying properties on the "cost to reproduce" basis, huge sums were added to corporate surpluses, which were, in turn, capitalised by the holding companies. This led to the creation of "income" by shifting ownership from one minor holding company to another, the "profit" on the "sale" going to the super-holding company.

Limited as some defenders of the holding companies claim these practices to have been, and difficult as they are to prove, the consumer has come to feel that somehow these colossal combinations have a sinister meaning for him and that out of his pocket have been extracted excessive profits to support them. In spite of the efforts of local regulation, there is evidence available that group ownership, having at first lowered rates, passed into another phase wherein costs have actually been increased or further reductions prevented.

The Rayburn Bill

For six years the Federal Trade Commission studied the problem, and then in 1935 made a report to Congress, which was largely the basis of the Rayburn Bill, which has for its apparent purpose the present control and final elimination of all holding companies in the public utility field. The Bill provides for the registration of all these companies, and the disclosure in its application of every imaginable detail of its relationship with subsidiary companies. From the date of registration every activity of the holding company is to be subject to governmental supervision, regulation and restriction.

There have been cases where holding companies invested in local industries to develop them and the community. All such investments are to be disposed of and none incurred in the future. It may be that the sale of appliances by utility companies will also be prohibited. The ownership of natural gas pipe lines by companies largely interested in electric power is prohibited, and any such property now held must be disposed of.

The ownership of both power and manufactured gas companies in the same territory is forbidden, and the sale of one or the other interest required. There are many other restrictions and regulations, but their importance pales into insignificance in the face of that section of the Bill which provides that immediately after January 1st, 1940, every public utility holding company is to cease to exist unless it can obtain a certificate from the Federal Power Commission that its continuance is necessary for the creation of a geographically and economically integrated public utility system serving an economic district extending into two or more contiguous States, and that the merger or consolidation of such a holding company with its subsidiary companies is impossible under the applicable State law. The plain fact of this proviso is that there probably does not exist a single company that could survive in its present form, if it had not already been dismembered and disintegrated by the operation of other features of the Bill.

Public hearings have been held by the Senate and considerable data has been submitted in support of the Bill. The public utility holding companies are having an opportunity for presenting their views and are circularising their stockholders for the purpose of getting them to bring pressure to bear on Congress to modify the Bill. Advertising campaigns are being carried on tending to show the great economic value of the holding company and the widespread suffering and loss which will be visited upon the innocent investors by the wholesale destruction of values certain to flow from an enforcement of this law.

The Effect on Security Values

The intensive political campaign being built around this issue, favourable to it and other destructive measures against the utilities, seems very strange when the insignificance of the issue to the average consumer of gas or power is considered. The average domestic consumer of electricity spends hardly ten cents a day for this service and for gas perhaps the same. With the cost of living constantly increasing, with the price of many commodities doubling and trebling, it seems strange indeed to engage such great forces and develop such tremendous energy in a campaign, not only to reduce the price of electricity and gas, but to destroy the investment values of the holding companies, at a loss to security holders in the aggregate large enough to pay the entire power and gas bill of the nation for years to come.

It is not a programme of "sharing the wealth" and "soaking the rich" so popular with a certain type of mind. The common and preferred shares of public utility holding com-

panies have been widely distributed in small allotments so that they are largely held by employés of the companies, by wage-earners, small tradesmen and elderly people largely dependent on security income. Life insurance and trust companies have also been heavy investors in public utility companies but their investments have mostly been confined to bonds and preferred stocks of operating companies. Nevertheless, under any programme of widespread attack on holding companies and on rates of operating companies, even the highest grade utility security values will suffer to the detriment of investors.

While it is generally hoped, and in some circles even expected, that firm opposition to the present destructive campaign will appear and be successful in preventing complete disorganisation of the great utility industry, it is nevertheless certain that great changes are coming and that the functional organisation of operating companies and their holding companies as we know them to-day is to undergo a complete metamorphosis.

The Commissioners' Fuel Returns

THE "Analyses and Summaries of the Returns of Fuel Consumption and Units Generated" for the year ended December 31st, 1934, have been issued by the Electricity Commission (Stationery Office, 1s. 6d.). The particulars relate to authorised undertakings, traction authorities and certain non-statutory undertakings.

Returns were received for 470 generating stations—a decrease of nineteen from last year; the difference is due to the closing of twenty-nine stations before January 1st, 1934, the commissioning of three new stations and one standby station during the year, and the inclusion of six previously operated on a non-statutory basis.

The kWh generated at these stations was 16,896 million (an increase of 12.97 per cent. over 1933) and 11,479,000 tons of coal, coke and oil (7.51 per cent. increase) were used. The 267 steam stations produced 95.52 per cent. of this total. Water power came second with an increased output of two-fifths compared with the previous year; fifty-two stations (including composite stations) were responsible for 2.75 per cent. of the aggregate.

The output of the twelve waste-heat and waste-gas stations went up by nearly one-third and accounted for close on one per cent. of the whole amount. Oil engines in 145 stations suffered a reduction in output equivalent to one-seventh of that for 1933, and turned out only 0.39 per cent. of the total kWh.

The average coal consumption per kWh generated in the steam stations was 1.58 lb. (1.65 in 1933). The results ranged from an average of 1.35 lb. for the twenty-five stations producing over 200 million kWh per annum (only five of which fell below 20 per cent in thermal efficiency) to 7.71 lb. for the few with an output of less than 100,000 kWh each.

The lowest fuel consumption per kWh was returned by Battersea (London Power Co.) with 1.06 lb., but Barking B (County of London Co.) had the best thermal efficiency at 27.95 per cent. (1.09 lb.) which was 0.71 better than the first-named. The performance of Clarence Dock (Liverpool Corporation), which secured the premier position last year, improved to 1.09 lb. and 26.82 per cent., giving it a lead over Ironbridge (West Midlands J.E.A.) which secured 26.12 (1.4 lb.). Dunston "B" (North-Eastern E.S. Co.), which has been handicapped by the change of frequency complications, nevertheless attained 25.35 (1.22 lb.).

Five stations had individual outputs in excess of 500 million kWh: Battersea; Deptford West (London Power Co.) with 23.99 per cent. efficiency; Barking A with 21.67 per cent.; Barking B; and Barton (Manchester Corporation) with 21.74. Other steam stations with efficiencies of over 20 per cent. were: Hams Hall (Birmingham) 23.41, Brighton 20.95, Portishead (Bristol) 21.85, Yoker (Clyde Valley Co.) 20.38, Longford (Coventry) 20.02, Croydon 20.76, Spondon (Derby and Notts Co.) 23.86, Portobello (Edinburgh) 21.83, Hackney 22.62, Sculcoates (Kingston-upon-Hull) 20.37, Kearsley (Lancs E.P. Co.) 23.7, Kirkstall (Leeds) 23.21, Lister Drive No. 3 (Liverpool) 20.77, North Tees (North-Eastern E. S. Co.) 20.91, Brimsdown B (Northmet Co.) 23.07, Chadderton (Oldham) 20.63, Blackburn Meadows new (Sheffield) 24.86, Hartshead (Stalybridge, &c., Board) 20.77, Ferrybridge (Y.E.P.) 21.79, Thornhill (Y.E.P.) 24.39, and the three stations of the London Passenger Transport Board—Greenwich (20.01), Lots Road (21.42) and Neasden (20.89).

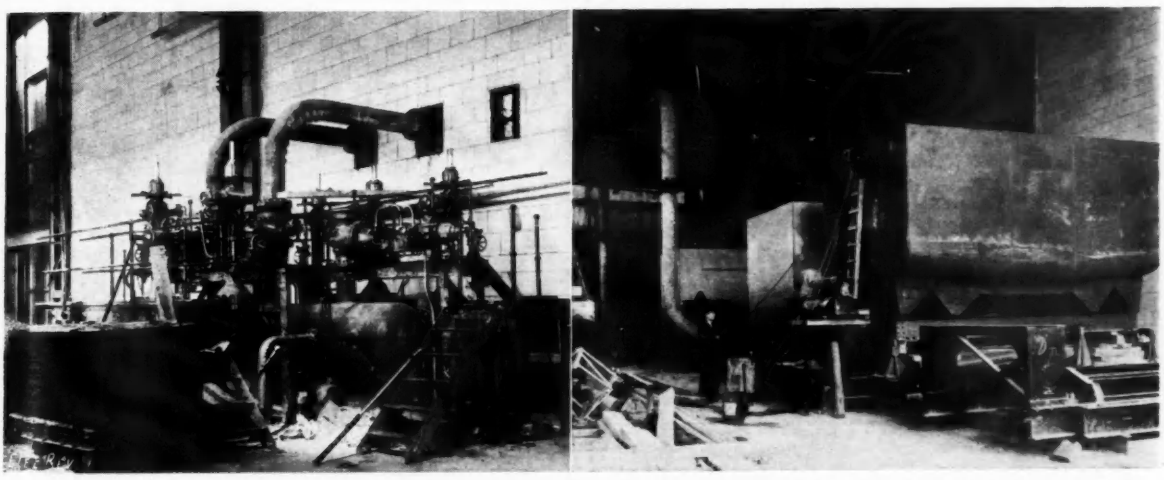
Apart from these stations good results were obtained by several smaller stations having regard to their output and operating conditions, such as Llanelly, Padiham (Lancs E.P. Co.), Bonnybridge (Scottish Central Co.), Atherton (S. Lancs Transport Co.), Rawtenstall, Canterbury, Heston and Isleworth, Ilford, Wakefield, Slough and Barnsley, each of which headed its group, based on output, for either thermal efficiency or low fuel consumption.

Nine oil-engine stations showed better thermal results than Barking B. The number in the previous year above the best coal-fired station was twenty-five, but this is a measure of steam station improvement rather than of oil-engine deterioration, since twenty-nine were better than the 1933 figure for Clarence Dock and the average fuel consumption per kWh for all oil-engine stations was 0.78 instead of 0.80 lb. The best of this class was again the Yeovil Co.'s station which returned 31.07 per cent. (0.58 lb.) as against 30.64 (0.59 lb.) in 1933. St. Martin's Lane (Charing Cross Co.), Basingstoke, Buxton, Macclesfield and Market Drayton returned over 29 per cent.

The best gas-producer station was once more Leek with 12.21 per cent. and 2 lb. The average fuel consumption of the eleven stations (fifteen in 1933) in this group, which generated altogether 6.44 million kWh, was 2.27 lb.

There were sixteen stations operating dust destructors and seven operating engines using town's gas. The majority of these included other plant; the first batch produced 55 million kWh and the second 582,000 kWh. The increase in output for 1934 of 12.91 per cent. was distributed among the ten regional areas of the Central Electricity Board as follows in percentages of the 1933 figures: N. Scotland, 44.55; Central Scotland, 12.50; S. Scotland, 7.56 decrease; N.E. England, 11.48; N.W. England and N. Wales, 11.87; Mid-East England, 12.07; Central England, 16.02; East England, 24.63; S.E. England, 10.88; S.W. England and S. Wales, 14.28.

The area in which the greatest number of kWh was generated was the S.E. England, where 5,977 million was provided by 112 stations. The next largest were N.W. England and North Wales in which 2,850 million kWh was generated in seventy-nine stations and Central England in which 2,315 million kWh was generated in forty-two stations.



Further views of the plant at the Tir John, Swansea, station weighing tank (see p. 624). **Left: A steam receiver. Right: The condensate**

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Asymmetric Side-band Radio Broadcasting

WIRELESS broadcasting technique is hampered because of the scarcity of channels and the multiplicity of transmitting stations. The spectra of frequencies radiated by stations occupying frequency-contiguous channels overlap, and the audio-frequency output from the receiver which is designed for ordinary domestic reception must be limited to meet the existing conditions of transmission. It is improbable that European nations will agree to limit either the existing power or the number of working stations; but, if it were possible to modify transmitters so that the spectrum of frequencies radiated contained the carrier and only one set of side-bands, spectrum overlap would be avoided or minimised.

The paper by Mr. P. P. Eckersley which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 1st contains suggestions for limiting the frequency band-width of transmissions by methods which are neither elaborate nor costly and could be easily incorporated in existing transmitter circuits. It is shown, also, that the adoption of the suggested technique would not cause service dislocation. A quantitative analysis indicates that, although the proposed adaptations do not limit the transmitted spectrum to a band width containing only the carrier and one set of side-bands, and although the transmission of certain vestigial side-bands is essential to the method, nevertheless, if the methods were adopted, spectrum overlap could be greatly minimised and transmission conditions would be more favourable to high-fidelity reception than they are to-day.

The author claims to have proved the practicability of both the methods described in his paper in the practice of high-frequency broadcast distribution by wire. Furthermore, during a recent visit to America he inspected the apparatus developed by Wired Radio, Inc., and found that from long experience it also had arrived at exactly similar conclusions and had adopted the same methods as those independently developed by the author and his colleagues. Certainly, the quality of reproduction in these high-frequency systems is of a very high order.

The author says that he may, perhaps, claim to have taken the independent step of recommending the broadcasting authorities and others to study a new application of what is to some well known, and to have shown that no essential difficulty should stand in the way of its practical application. He also claims a certain originality in suggesting how to adapt high-power modulation transmitters for asymmetric broadcasting.

Those who have helped in the work which has led up to the understanding of the processes involved in the new technique and have given useful advice as to the best way to set out this paper have, nevertheless, somewhat cynically counselled non-publication because they fear that the European authorities will take advantage of the knowledge, not to adapt their transmitters to give the chance for better-quality reproduction, but rather to crowd even more stations into the already over-burdened ether. If station carrier waves were moved closer together, however, the audible heterodynes produced by these waves would present a serious difficulty for solution by the receiver designer.

Mr. Eckersley concludes with the hope that, if these proposals are ever adopted, the influence of responsible technicians and those interested in the designing and marketing of wireless receivers will be used to prevent the basic idea of asymmetric side-band transmission from being put to such an undesirable use.

The Uses of "Pure" Coal

A LECTURE on pure coal and its applications was delivered to members of the INSTITUTE OF FUEL in London on April 30th by Monsieur Maurice F. Bertrand, of the Société Anonyme d'Ougrée-Marihayé, who crossed over from Belgium for the special purpose of explaining to members the work done by his company in this connection. The lecture was followed by a discussion and an informal dinner.

After dealing with the constituents and composition of coal the author outlined his company's method of manufacturing the pure variety.

With regard to industrial utilisation the electro-metallurgy of aluminium and light metals required anodes containing less than 1 per cent. of ash, or more exactly, less than 0.5 per cent. of Fe+Si, because the metal must have a purity of 99.5 per cent. in order to prevent rapid corrosion. The anodes were produced exclusively from oil coke, the residue from crude oil distillation and cracking processes, which in recent years had been greatly improved, with the result that the quantity of oil coke produced had diminished, and consequently the aluminium industry had to look for a substitute.

In Germany coke ovens had been adapted for the carbonisation of pitch, and with much trouble a fairly satisfactory pitch coke had been obtained. Unfortunately, the process was very expensive, because nearly two tons of pitch was required to produce one ton of coke.

The author claimed superiority for the special coke produced by the carbonisation of coking coal which had been purified by his company's method. He maintained that anodes manufactured from special coke compared favourably with those manufactured from oil coke on account of their better graphitisation, which reduced the electrical resistance and increased their life in the electrolytic bath by about 25 per cent. The combustion of the anode in air was also reduced on account of its lower combustibility.

Electrical Manufacturing in Russia

DURING 1934 the Electrosila Works, Leningrad, produced a large range of heavy electrical plant. For the first time it was possible to produce turbo-generators of large capacity constructed entirely of Soviet raw materials. It is said that exported plant is characterised by its exceptionally high cost, refinement and elaborate external finish. The works produced a new series of 400 to 1,500 h.p. two-pole motors running at 3,000 r.p.m. In connection with metallurgical processes the construction of 650-kW single-phase generators operating at 500 cycles was satisfactorily completed.

In 1934 the Electrosila Works produced the first generators for export, turning out three machines for Turkey. These machines have a capacity of 1,500 kW at 0.7 p.f., 6,300 V, 3,000 r.p.m. The efficiency is stated to be 94.3 per cent. The maximum temperature rise in the stator and rotor windings is 40 deg. and 60 deg. C. respectively. Last summer a series of high-frequency generators was also constructed for the Metallurgical Works, Leningrad. These were 650-kVA single-phase machines operating at 3,000 r.p.m. 500 cycles (unity power factor) and they were of the pole-changing type. During the current year it is proposed to build synchronous motors of 8,000 h.p. running at 3,000 r.p.m.

It is stated that the output of electrical plant during the second Five-Year Plan has given this phase of industry a significant place in the economic life of the country. In 1933 overhead lines operating at 220 kV were becoming common, and for transmission between Leningrad and Svir groups of transformers totalling 60,000 kVA are in operation. In connection with this scheme oil circuit-breakers of the latest American pattern are being used. These have a rupturing capacity of 2,500,000 kVA.

Some idea of the phenomenal growth of the electrical industry in the Soviet Union will be gained from the following figures which show against each item the percentage increase in production of plant in 1934 as against 1933:—Steam turbines, 32; water turbines, 26; boilers, 46; a.c. generators, 112; and d.c. generators, 72.

The average number of workers in the electrical industry in 1934 was 70,577, or 716 more than in 1933. It is estimated that the output per worker increased by 13 per cent. during the twelve months.

Amplifiers in a Police Court

One of the Magistrates' Courts at Rotherham has recently been equipped with loudspeaking apparatus which it is said is giving complete satisfaction to everyone concerned with the duties of the court, incidentally making the work much easier for all. The installation, which consists of a G.E.C. microphone mounted on the front of the witness box and connected by means of a special amplifier to a loudspeaker fitted below the desk of the chief magistrate, renders the witnesses' evidence distinctly audible to the whole of the court. The system has been found to save a good deal of time, and witnesses who often speak in very low tones will not in future be put off their balance by remarks such as, "Speak up" or "We cannot hear you." In addition, of course, the person in the dock benefits. The electrical contractors for the installation in Rotherham Court House were Messrs. Smith Bros. (Rotherham), Ltd.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Should Salesmen Be Able to Cook?

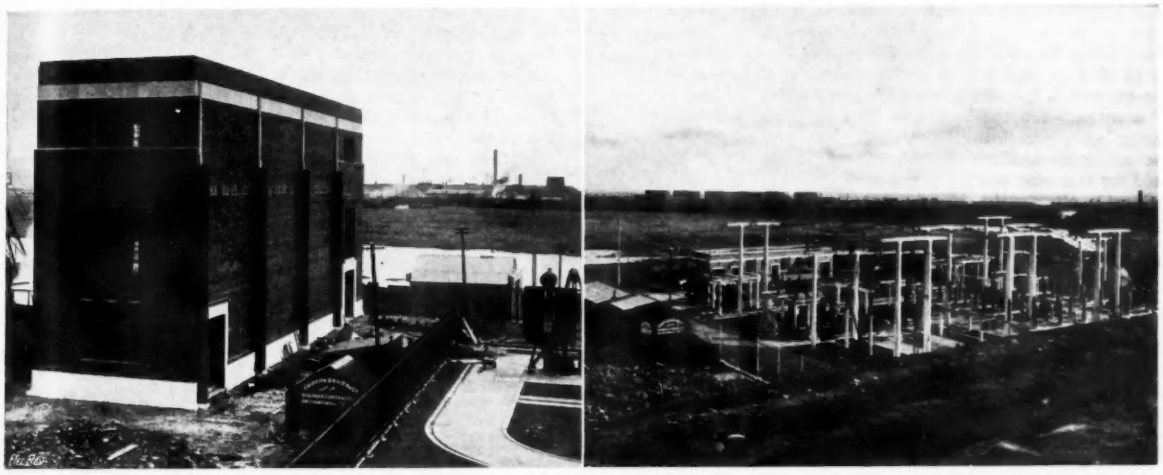
Miss Ester Purvis makes a good point in her letter of April 11th in suggesting that the cooking demonstration is better left to the woman, at least when it takes place in the home.

I would say, in parenthesis, that it is a definite advantage if the salesman can cook something quickly and deftly. It appears that in Holland short courses—with limits—are given to engineers or salesmen with distinct advantage. But I feel this knowledge should be used only in an emergency, when it can be very telling.

The ideal thing, as Miss Purvis urges, is to leave the cooking to the woman demonstrator. But can she invariably cook? In the majority of cases she cannot. The production of a few cakes is not necessarily cooking—it is often a "stunt." The housewife wants to know how to cook that-something-different which would please her family and by this means can be drawn subtly enough to the medium for cooking it.

When will the demonstrator awaken to the fact that, just as the engineer has had to do it, she must get down to *learning* her job? A thoroughly good cook has an enormous natural field to draw upon from which to interest her listeners. More than this, engineers are now alive to this essential fact and the demonstrator of the future will have to cook well or sink into the background. I believe the day of the mediocre demonstrator is ever; she must now be outstanding; she must compel attention by her voice, manner and technical knowledge, and, where required, be an expert cook.

London, S.W.3, *April 18th.* HELEN MINOPRIO.



The main switchhouse at the Tir John station, Swansea, for housing the Corporation's and Central Electricity Board's equipment; and (right) the Central Board's sub-station in course of erection. (See page 624)

Street-lamp Maintenance

Is there such a thing as a good mechanically propelled ladder with platform for dealing with high c.p. street lamps? The ladder might be carried on an electrically propelled vehicle and it should be of a very substantial nature so that heavy lamps of the modern type may be handled in bad weather. It must also be capable of being fixed firmly so that it will not move on a steep slope. Details of such a ladder will doubtless be welcome to many undertakings. LADDER.

Tynemouth, *April 29th.*

The Rules and the Register

In his letter in your issue of April 19th Mr. Alex. Milne says he does not agree with me on all my points, evidently referring to an article in a recent issue of another journal, but he evidently agrees with the "mess" as described by me, and as for the "mass," the rules have now got almost to the size of the New Testament, whereas, I contend, they want getting down nearer to the Ten Commandments.

Mr. Milne is evidently all out for compulsory registration, and this has been the theme of my articles in the technical Press for years. We must have a compulsory code of wiring rules and compulsory registration, and/or membership of the E.C.A. I am just as convinced as ever that no-one ought to be allowed to carry out work on the public supply mains other than those firms who are members of the E.C.A. or are registered.

If the Commissioners put Wiring Rules into force next January the supply authorities will be strengthened in their attitude towards insisting on safe and satisfactory installations, but there is still one great weakness and that is in connection with the "amateurs" and "jobbers" and all sorts of handymen and boys who are regularly carrying out additions to existing installations and spoiling what were originally good jobs.

I cannot accept the opinion of many of my friends that Parliament will not eventually agree to pass a Bill forbidding other than "authorised" firms from carrying out electrical wiring work on the public supply mains, and Mr. Milne appears to me to agree on this point.

The number of firms "turned down" by the Register is a slight indication of the class of people carrying on business as contractors and there must be thousands of others far worse who could never apply to the Register, but are doing work on installations that never comes under the eyes of the supply authorities' inspectors—work which is highly dangerous to the user. A.c. can be a dangerous agent unless it is handled, installed and dealt with in a manner with which only qualified engineers are conversant.

The public has a perfect right to be protected from the unskilled and incompetent, just as much as it is protected by law from the unscrupulous and dishonest trader. The grid can be and must be loaded, but it must be with installations which are a credit to the British electrical industry, and will give that satisfactory service of which British engineering has always been proud. HARRY MOSS.

Bradford, *April 24th.*

Registration is Vexation

I have read Mr. J. R. Morris's complaints with amusement and it appears to me that he has merely "given the show away." Although I am not a member of the E.C.A. it is obvious that that Association would not admit members of the E.T.U. and conversely the E.T.U. would not admit members of the E.C.A. in view of the fact that one association consists of employers and the other of employés.

Mr. Morris complains that he was employed for nearly six years with one firm but was pushed off without as much as "thank you." Was thanks necessary if wages were received? Mr. Morris finally informs us that he has failed to qualify for registration and that he is now staying out and saving useless fees. This sounds rather like the proverb of the fox and the grapes. ALEX MILNE.

Glasgow, *April 22nd.*

The Magnetic Field

In your issue of April 26th Prof. Howe admits he is acting as the "devil's advocate" on a point with which he does not agree, but this is the one advanced by Dr. Clayton.

Even if we admit that magnetic lines are snapping from yoke to yoke of the armature and cutting conductors on the way, the machine should still work as a motor, according to the BIL formula and the left-hand rule. The machine failed as a generator and would therefore fail as a motor, and so disprove the BIL formula.

Prof. Howe explains the machine's failure to generate by saying that an equal and opposite voltage to that generated

in the conductors in the air gap is generated by the movement of a loop of wire along the armature. This argument is unsound because no loop of wire is moving along the armature in the manner illustrated by his fig. 3, and therefore cannot be the seat of voltages which might be caused by such movement. As the resultant induced voltage is zero it follows that no voltage is induced in the air gap conductors; therefore the flux-cutting theory is disproved directly, and the BIL formula indirectly.

Figs. 1 and 2 in Prof. Howe's letter do not illustrate the machine which I described as this had no S pole in the interior, and his arguments in connection with them are no vindication of the BIL formula and left-hand rule. He seems to explain the machine's failure as a motor by applying some other law, thereby tacitly agreeing with me that the BIL formula is incorrect.

Dr. Clayton's machine should have worked both as motor and generator according to his book "The Performance and Design of Direct Current Machines" published in 1927, more particularly to pages 7 (at foot) and 9. In the former case he says:—"When a conductor carries current in, and at right angles to, a uniform magnetic field, a force is set up between the conductor and the field. Measured in dynes, this force is given by the product: length of conductor in cm.×density of the field in lines per sq. cm.×the current in absolute measure. Since 10 A=1 absolute unit of current, the force set up when the current is I_a amps., is $f=BLI_a\times10^{-1}$ dynes. For the case of a smooth-core machine, the lines of force at the centre of the pole are practically radial, and therefore perpendicular to the armature conductors. The above formula will therefore hold for the case of such a machine."

Shortly afterwards, he says: "The work done in moving the conductor can therefore also be expressed in the form $W=\phi I_a\times10^{-1}$ ergs. This expression not only holds for the case of a field of uniform density, but for *all* cases, when a conductor carrying a current of I_a amps. is moved so as to cut through ϕ lines of magnetic force, the work done is $\phi I_a\times10^{-1}$ ergs."

From this it seems to me that Dr. Clayton is here teaching something which had been disproved by the failure of his own machine. There is no reference to snapping lines of force.

The teaching given above will be found in every book dealing with the subject, and so the point is of considerable importance.

C. HARGREAVES.

Bradford, *April 28th.*

Colliery Electricians' Wages

With reference to the recent letters under the heading "Skilled Men's Plaints" I should like to draw the attention of electrical engineers, and members and officials of the Electrical Trades Union to the plight of the colliery electrician.

The colliery electrician's wage in Northumberland is 6s. 9½d. per day and in Durham 6s. 7d. per day; this is the same rate of pay as the labourer, screener and blacksmith's striker get. For this handsome salary the electrician is expected to know the requirements of the Government Acts, rules and regulations for the use of electricity in mines. As a tradesman he has got to be absolutely efficient in the carrying out of his duties as plumber-jointer, armature winder, linesman and electrical fitter, and he must be conversant with the installation and maintenance of modern colliery plant.

Is there any other class of electricians in the country so badly off? If so I should like to hear of them.

L. W. COLE.

Bedlington, *April 26th.*

Tests on a Voltage Regulator

ONE of the greatest limitations to the use of automatic voltage regulators in distribution circuits is their relative weakness in withstanding the mechanical forces due to severe fault and short-circuit conditions. The position is well summed up in respect of ordinary induction regulators by Gehrkens, of the American General Electric Co., who says, on page 439 of "The Induction Voltage Regulator," that the feeder voltage regulator is more liable to injury both mechanically and electrically, and more likely to cause damage to the station, than any other apparatus. He adds that as the regulator is a costly device it is impracticable to design it with the same factor of safety as is feasible with other series devices, and that the short-circuit current must, therefore, be limited by properly designed current-limiting reactors.

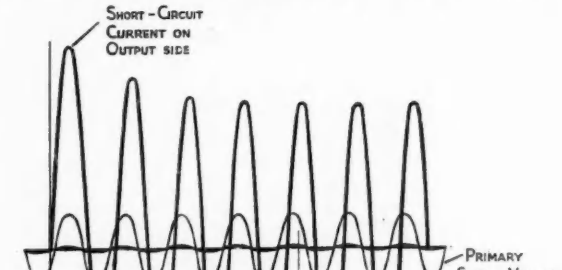
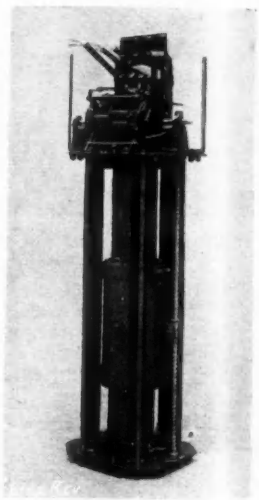


Fig. 1.—Oscillogram of the short-circuiting current in a single-phase moving-coil regulator; the unmarked thick curve shows the normal full-load current to the same scale as the short-circuiting current

The moving-coil voltage regulator marketed by Ferranti, Ltd., has been referred to several times in the ELECTRICAL REVIEW. Voltage regulation is obtained by means of an isolated and short-circuited coil moving up and down an iron core over fixed coils. A distinctive feature of this regulator is that due to neutralisation the mechanical forces on the coils—both fixed and moving—are extremely small. These low forces, incidentally, eliminate noise and vibration and permit operation of the largest sizes by a single induction disc motor of the gramophone type.

The following tests were carried out on a standard automatic regulator selected at random from a number being manufactured for a large supply company in the south of England and designed to give a variable boost up to 11¼ per cent. in a 50-kVA 240-V single-phase circuit. The regulator was connected to the supply mains and then suddenly short-circuited on the output side. In all tests the moving coil was set in the position giving the worst mechanical forces, corresponding approximately to 10 per cent. boost.



A standard automatic moving-coil voltage regulator

Since in a normal distribution circuit the impedance in the system is sufficient to limit a short-circuit current to about twenty-five times the normal, several tests were carried out under these conditions, the oscillogram showing values varying from twenty-seven to thirty times full load. After these tests the regulator was lifted from its tank for examination, but no signs of damage appeared.

Several tests were subsequently carried out at a voltage slightly above normal with no limiting impedance in the secondary circuit, the short-circuit currents being fifty-five to fifty-seven times the normal full-load value. Due to asymmetry or "doubling effect" the current at the instant of switching-in was in some cases considerably greater, the maximum value being seventy-seven times full load. Since the forces are proportional to the square of the current, this corresponds to forces 5,920 times the normal full-load value.

Examination after the tests discovered no signs of damage. The regulator operated both mechanically and electrically, and has been despatched to the customer without any alteration.

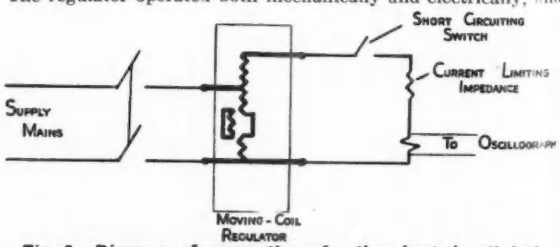


Fig. 2.—Diagram of connections for the short-circuit tests

Under operating conditions, even with a power supply of infinite capacity, short-circuit currents as great as in these tests could not occur, and the results show that the regulator needs no current-limiting reactors, notwithstanding the low impedance of the regulator.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

All-insulated Switchgear

Wherever a t.r.s. wiring system is used it should be associated with an all-insulated shockproof installation using bakelite switches, lampholders and other accessories in order to eliminate earthing difficulties. The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has introduced a range of 30-A all-insulated switch fuses and service cut-outs for use on these systems, and also in chemical works, laboratories and other places where corrosive vapour is present. Two important features are the mounting of all live parts on porcelain to prevent risk of "tracking," and the sturdy construction and attractive finish of the bakelite.

In the new switch-fuse the porcelain interiors and d.p. quick make-and-break action are similar to those employed in the standard ironclad pattern, and the usual interlocking feature is provided. Each end of the case has three knock-outs, the middle one being oval to enable flat twin cables to be used.

The carrying and rupturing capacity specified are well in excess of B.S.S. requirements, and during special endurance tests carried out by the makers 36,000 operations took place without damage.

All-insulated fuse units, sealing troughs and neutral links are also available. The fuse units, which comply with B.S.S. No. 88 (1931) are of the porcelain enclosed type with bakelite covers secured by a spring clip and can be sealed; the terminals are suitable for looping, and the fuse wire passes through an asbestos tube held in position by the spring contact clips on the holders. The sealing troughs are constructed in two parts and are provided with three alternative cable entries, while the neutral links consist of a brass block enclosed in a brown porcelain body with a single entry at one end and three entries at the other.

Double-pole cut-out sets, consisting of a sealing trough and either two fuse units or one fuse and one link, are made up with the accessories mounted on a plywood backboard fitted with corner insulators.

Push-button Starters

MESSRS. ERSKINE, HEAP & CO., LTD., Lancashire Switchgear Works, Caroline Street, Salford, have recently put on the market a push-button contactor starter for use up to 10 h.p. at 400/600 V and 5 h.p. at 200/250 V. Several special features are incorporated; for instance, the contacts are robust and are designed to give a true rolling contact in order that the actual make-and-break takes place at a widely different point on the contact from that used for carrying the current permanently. The overload tripping mechanism is of the magnetic type, fitted with inverse time-limit dashpots, the time element of the dashpot and also the overload setting being readily adjusted to suit conditions.

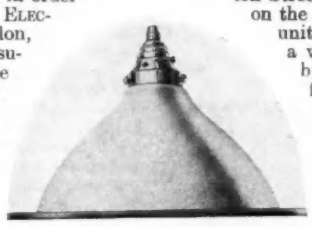
The new Erskine, Heap push-button starter

The shielding of the contacts is effected by means of a one-piece sillumimite moulding, giving full protection between phases and also to earth. The units can be provided with isolating gear, so that when the case is opened all parts inside the contactor portion are automatically made "dead," the "live" contacts of the isolating switch being suitably protected and mounted separately to the main contactor portion of the gear. The lid is interlocked to prevent its being opened unless the contactor is in the "off" position, thus eliminating the possibility of breaking circuit on the isolating contacts. The operating magnet is of robust construction and power, enabling it to operate under adverse conditions and ensuring continuity of service. It is quite silent in operation.

The contactor has been designed with a view to covering (a) With self-contained push-buttons; (b) without push-buttons and suitable terminals for remote control; (c) for remote control in addition to the push-buttons; (d) arranged for remote operation by means of a float switch or similar device, with or without a separate switch for automatic or hand control; (e) for remote control by means of a separate push-button for "on," "off" or "inching"; and (f) with the parts mounted on a light chassis, this arrangement being suitable for mounting in the casing of the machine when remote operation is desired.

Recessed Dome Reflectors

A recessed dome reflector for flush ceiling fitting in shop windows is a new product of MESSRS. HOLOPHANE, LTD., Elverton Street, Vincent Square, London, S.W.1. It is made on the same lines as the 964G series, but instead of the unit being of the gallery suspension type there is a wide flange to the rim for fixing to the ceiling by four screws. Three sizes are made, suitable for 60-75 W, 100 W, and 150 W lamps.



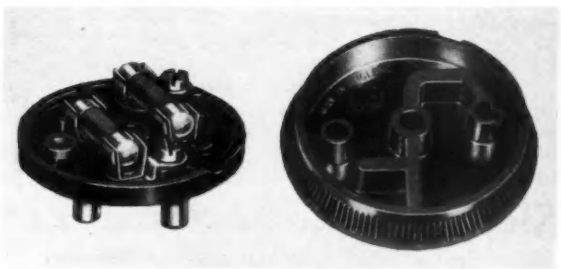
A side view of the new reflector showing the flange

A Long-range Radio Receiver

The "Overseas B7," a new product of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is designed to give long-range reception on short and medium waves, although operating entirely from batteries. The design is, in many respects, similar to that of the "Overseas 7" a.c. mains receiver. The wavelengths covered are 12 to 550 metres by means of five wave-band positions. Seven valves are employed, and tuning is by a single control; for the output a "Class B" circuit is used.

Protecting Small Appliances

A fused plug produced by Messrs. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester), for use with clocks, radio receivers, table lamps, &c., is interchangeable with all 5-A two-pin sockets, and has incorporated two cartridge fuses

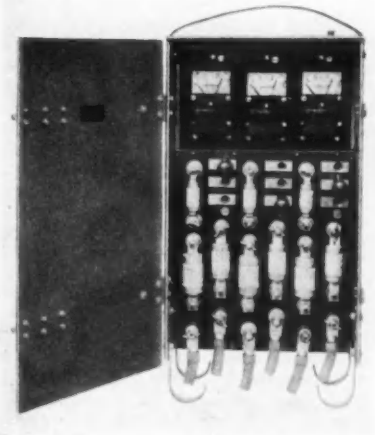


The "Goltone" fused plug.

rated at 2 A which are easily replaced after unscrewing the top of the plug, as they are held only by spring clips. Another model differs from the type illustrated, inasmuch as, when provided with a special base, a milled locking nut and screw through the centre of the plug enable it to be fixed to the base to prevent its inadvertent withdrawal.

Load-indicating Cabinet

The illustration below shows a new portable three-phase load-indicating cabinet for l.v. overhead lines and sub-stations that has been developed by MESSRS. PRICE & BELSHAM, LTD., Tamworth Lane Works, Mitcham, Surrey. The three indicators, one for each phase, are mounted across the top of the cabinet with a bakelite panel below, while at the back of the panel are the three current transformers. In order to cover all loads likely to be met the transformer primaries have tappings brought out to a plug block on the panel under each indicator, and the ranges are changed by moving the plug from one socket to another. Cartridge-type fuses for each range are mounted on the panel, so that if the service fuses are withdrawn to couple in the transformers the lines or cables remain protected. The terminals for connecting to the lines or cables are at the bottom of the panel.



The "P. & B." portable load-indicating cabinet

The cabinet itself is constructed of "Plymax" metal-covered plywood. The corner joints are covered by angles, riveted and soldered on, so that all edges are sealed. Two

chocks are fitted to the back with a strong leather strap for fixing to poles. Indicator cases and transformer cores are wired to the cabinet earthing terminal on top. Five standard types are available, four of which weigh 65 lb. and the fifth 26 lb.

Light-duty Switch Sockets

Outlets of 2 A rating are useful as lighting points, the diversity factor permitted under the 10th edition of the I.E.E. Regulations allowing ten of them to be used on a 5 A circuit instead of only one if a 5 A size is fitted. This important point, together with the low price of the smaller outlets, should result in many more light-duty fittings being installed.

The M.K. 2 A surface-mounting switch socket plug.

We recently examined a range of 2 A switch sockets of the all-insulated type, both in surface and sunk patterns which MESSRS. M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, London, N.18, are manufacturing. The surface type has a recessed back for ease of wiring, and the sunk type can be supplied with or without an iron box; both are made with three pins only for safety and in order to comply with the new rules which practically exclude the two-pin type for general work. The switch embodied is of the slot type, this standard switch action having proved quite reliable, and the socket tubes are of the latest resilient type on floating centres. The plug is fitted with non-closing pins and the cord grip complies with B.S.S. 546.

A Drill Container

A drill container with a special top which is pivoted by means of a screw to rotate so that a hole comes over the drill selected has just been placed on the market by MESSRS. FRY'S (LONDON), LTD., 24, King Street, London, E.1. It is cylindrical in shape. Two sizes are made, one, 5 in. long, 1⅛ in. in diameter, holds drills $\frac{1}{16}$ to $\frac{3}{32}$, and the other, 6 in. long by 2 in. in diameter, will take drills $\frac{1}{16}$ in. to $\frac{3}{8}$ in. The sets are known as Nos. 34 and 35 respectively for carbon drills, and Nos. 334 and 335 for the high-speed type.

A Jubilee Receiver

A new radio receiver of the four-valve a.c.-d.c. superheterodyne type was announced on Wednesday by the MARCONIPHONE CO., LTD., 210, Tottenham Court Road, London, W.1. It is known as No. 223 in the "Jubilee" range and incorporates a reflex superheterodyne circuit with fully delayed a.v.c., the arrangement consisting of a heptode frequency changer, double-diode-pentode which functions as an i.f. amplifier, detector, l.f. amplifier and a.v.c., while the output stage contains a "Catkin" pentode. The fourth valve acts as a h.t. rectifier on a.c. and a low series resistance on d.c. mains. There are manual volume, tuning and wave-change controls with a supplementary "on/off" switch and push-pull sensitivity switch on the left of the cabinet. A fuse rated at ¾ A is inserted in each mains lead and the output is approximately 24 W. Cooling is effected by providing a convection deflecting cowl behind the mains dropping resistances, causing two streams of air to pass through the receiver.

Three new types of lighting fittings which have recently been introduced by Messrs. F. Thomas & Co., Ltd.

Electrical Engineering Practice. By E. Hughes, D.Sc., M.I.E.E.

New regulations and syllabuses for the City and Guilds Examinations

THE 1934-35 session at most technical colleges is drawing to a close and plans for next session's work are now under consideration. This is, therefore, an opportune moment to draw attention to the new regulations and syllabuses relating to the 1936 examinations held by the City & Guilds of London Institute in "Electrical Engineering Practice." The whole subject has recently been considered by a representative advisory committee under the chairmanship of Prof. Marchant, D.Sc., M.I.E.E., and it is believed that the changes, especially in regard to the final grade, will be very acceptable to many teachers and students.

The principal alterations in the preliminary and intermediates grades (previously known as grades I and II) consist of a curtailment of the syllabus of the preliminary a.c. section and an extension of that of the intermediate grade. The standard of the latter is undoubtedly well above the average of the a.c. papers in the Ordinary National Certificate, but it must be remembered that the C. & G. examinations in d.c. and a.c. can be taken separately, whereas in the National Certificate examination the two papers must be taken simultaneously together with a third subject. Also, it should be pointed out that examinations in the preliminary and intermediate grades are not held in England and Wales.

Important Changes

It is the final grade, however, that has been subjected to the most important changes. In this grade about one-third of the candidates are from overseas, and so far as home candidates are concerned one of the main purposes of this examination is to cater for those who are unable either on account of their occupation or of their earlier training to fulfil the conditions specified in the regulations for the Higher National Certificate. All will agree that no student should be awarded a final grade certificate in a specialised subject unless that person shows or has shown that he possesses a sound knowledge of general electrical technology.

Many readers will recollect that up to about four or five years ago the final grade examination consisted of one paper of a general nature and a second paper on a special branch of electrical engineering. No syllabus was given for the first paper, and the questions varied so much from year to year that for the part-time student in particular the examination became a gamble and was extremely unsatisfactory to candidates and teachers alike. Latterly, the practice has been to insert one question common to the five specialised sections in each of the two papers, these questions being intended to test the candidates' knowledge of electrical technology. Obviously, such a hit or miss arrangement is equally unsatisfactory for all concerned.

In the new scheme these difficulties have been overcome by dividing the examination into two parts which may be taken simultaneously or separately. No student, however, may enter for part II alone unless he has passed part I; also, for a student taking the two parts simultaneously failure in part I carries with it failure in part II. The syllabus for part I includes a reasonably complete treatment of a.c. theory together with the characteristics of alternators, a.c. motors and convertors of various kinds. The work is, in fact, very similar to that usually covered in the A1 course of the National Certificate scheme.

The sections in part II remain unaltered in number, but some of the syllabuses have been entirely recast, and they are now of such a nature that any A2 course should cover the work required by one or other of these sections. Section A, dealing with the design of electrical machinery, is the one which has undergone most transformation. Its new syllabus is given in considerable detail and covers the principles underlying electrical design rather than the extremely specialised knowledge that has been asked for in the past.

In section B references to prime-movers and boilers have been deleted, while the syllabus on transmission has been appreciably expanded. Sections C and D remain practically unaltered except for the inclusion of haulage gear, cranes and lifts under "Traction," an addition that is justified by the fact that this is undoubtedly the briefest of the five sections.

The syllabus on "Electrical Instruments and Measurements" has been set out more systematically and explicitly. The "design" of instruments has been omitted and the section should now be particularly suitable for students in the testing departments of manufacturers and supply authorities.

An Improvement

It will be evident that the new scheme possesses features that will be greatly appreciated by both teachers and students. The element of "pot luck" that has hitherto entered into the final grade examination has now been eliminated and the part-time student possessing normal ability and perseverance has every prospect of success. Furthermore, suitable classes may be found at any technical institute preparing for the Higher National Certificate. In conclusion, it should be stated that success in the final grade carries with it exemption from part II of the graduate examination of the Institution of Electrical Engineers.

Hire or Hire-purchase? By L. Norris

The advantages of direct sales

SUPPLY authorities, generally, in their efforts to obtain a satisfactory cooking and water-heating load seem to favour hire schemes by means of which their consumers may have cookers and/or water heaters installed upon signing agreements to pay a fairly small quarterly or monthly rental, and there is no doubt that these schemes have had the effect of increasing the domestic load very considerably. It is open to question, however, whether the system of hiring domestic apparatus is the most satisfactory from the point of view of future results.

Although there is not a great deal of information available on the subject, it is doubtful whether the charges usually cover the costs of installation and subsequent maintenance. Even assuming that these costs are met, there is the cost of the apparatus itself to be considered, and as there is little reason to suppose that any supply undertaking is run from philanthropic motives, such apparatus must be paid for directly or indirectly out of revenue. The unit charge for cooking or water heating is generally less than that for lighting and other domestic purposes, and it follows that those people who have not yet seen the light, and are still using other agents for domestic purposes, are helping to pay for the benefits bestowed upon their more fortunate brethren. A form of penance, no doubt, and although the penance may be so easy to perform as to cause no inconvenience to the performer, the arrangement is not strictly equitable.

[Jerome

Mr. L. Norris

One is tempted to ask whether hire schemes for electrical domestic apparatus would now be operating if our rivals had not been conducting similar schemes for some years, apparently with considerable benefit to themselves. Immediate financial benefit, however, should not be the only or the chief aim of any business which is intended to be of a permanent nature, and there is at least a suspicion that the gas companies would be in a much stronger position to-day with regard to the cooking load if their policy had allowed for more selling of gas cookers and less hiring.

Owners are Less Troublesome

Any electricity salesman will agree that those people most dissatisfied with gas cooking are, as a general rule, those who hire gas cookers. Those who own gas cookers are usually more or less satisfied with the results obtained and are not so ready with complaints against the gas company. Apart from this, they are the most difficult people to convert to cooking by electricity, for the simple reason that they wish to obtain their money's worth out of their gas cookers. Gas concerns now definitely encourage the purchase of their cookers instead of hiring, both in their sales efforts and in their advertising.

In districts where electric cookers may be hired it is very rare that one comes across a consumer who owns a cooker, in spite of the fact that there are an appreciable number of people who prefer to purchase an article rather than to hire it. No encouragement to purchase outright seems to be given to this class of person where a hiring scheme is in operation, and in some districts the idea is definitely discouraged, the consumer being persuaded to hire instead. Peculiar obstacles are placed in the way of the would-be purchaser, one such being that whereas the wiring, or a portion of it, is given free if a cooker is hired, it must be paid for by the consumer if the cooker is purchased.

This sort of thing may be due to the fact that the salesman finds that the internal organisation of his authority makes it much easier for him to put through an ordinary hiring agreement than to put through a cash or hire-purchase sale. Whatever the reason, it does not seem possible that the best interests of the supply authority concerned are being served, for a sale outright is surely more advantageous than a mere addition to the hiring scheme. The hirer and the purchaser will both consume approximately the same amount of energy, the purchaser in addition having paid for his apparatus and thus relieved the authority of some responsibility.

It would seem reasonable to suggest, therefore, that more effort should be devoted to selling electric cookers and less towards placing them out on hire, eventually doing away with the hiring system altogether, at least as regards electric cookers, kettles, wash-boilers, and other apparatus which may be regarded as being of a portable nature. By "portable nature" is meant, in this instance, the fact that such apparatus may be moved from one house to another without any more inconvenience than is experienced when moving furniture.

The Case of the Water Heater

The position is rather different when one considers water heaters, either of the immersion or self-contained type, for they must be considered as fixtures, in that they cannot be moved from one house to another without incurring considerable inconvenience and expense. Again, in connection with water heaters the installation costs are frequently at least partially met by the consumers, and maintenance costs are negligible compared with those for electric cookers on hire. This fact may be partly due to the fact that the water heater requires little or no attention from the consumer, who at the most has to do no more than operate a switch. Moreover, as water heaters do not lend themselves readily to easy removal they are difficult to sell outright to people who do not actually own their houses. Therefore, although even with this class of apparatus a sale would bring more immediate benefit to the supply company than a hiring scheme, the latter method is the only one to be adopted, with an occasional sale where the consumer definitely requires it.

If hiring were not adopted a certain number of sales could no doubt be effected with the aid of "high-pressure" methods, but progress and development would be too slow to be of any real use to the supply authority, and, in addition, many purchasers would turn into dissatisfied consumers if they found it necessary to move and discovered that they were not able to use their water heaters in their new houses.

The Period of Payment

Many potential cooker users cannot, of course, afford to purchase for cash apparatus costing anything from ten to twenty pounds, and the only way to make the acquisition of an electric cooker possible is to arrange suitable hire-purchase terms. The average person is usually quite satisfied with some arrangement which makes the necessary payments in the neighbourhood of £1 or £1 10s. per quarter, but there are unfortunately many people who cannot afford even these very reasonable figures, and to bring them within the scope of any hire-purchase scheme for apparatus such as electric cookers it would be necessary to extend the period over which payments might be made to seven or eight or even ten years. If hire-purchase terms of this nature can be arranged, the necessary quarterly payments are practically as low as the quarterly hire charges made by many supply authorities.

Although while this method of payment is in operation it does not differ very greatly from a simple hiring scheme, the consumer has the distinct advantage of knowing that the property will eventually become his own, and that the payments will eventually cease. There is also the decided advantage from the supply authority's point of view that the apparatus will not have to be taken back, overhauled, and reconditioned if possible for another consumer as is necessary under simple hiring arrangements should the user decide to move out of the district, or should he decide not to renew his agreement.

Looking to the Future

The development of the cooker load may be somewhat slower if no hiring scheme is in operation, but it should not be considerably slower if hire-purchase terms of a satisfactory nature can be arranged. Against this disadvantage there is the fact that, with electric cookers at any rate, a consumer who is the owner of one, or who will eventually become the owner, is a far more satisfactory customer than one who merely pays a rent for the privilege of using the electricity supply authority's property.

Although immediate benefits are very welcome they are frequently obtained at the expense of future results, and level-headed business men will usually agree that it is the future benefits that are most worth trying for. In spite of the development which is taking place, the domestic side of the electricity supply industry is still only partially developed, and the very real and lasting benefits which it will be possible to obtain in the not-too-distant future must not be jeopardised for the sake of a rate of expansion which may result in serious growing pains, forerunners of still more serious rheumatism.

New Books

Practical Armature Winding. By A. H. Avery. Pp. 118; figs. 71. London: Percival Marshall & Co., Ltd. Price 3s.

In his latest book Mr. Avery gives the reader the benefit of his wide experience and knowledge on the practical side of this subject. The sub-title, "A Guide to the Principles and Practice of Armature Winding, Particularly in the Smaller Sizes," is an accurate description of the contents, and anyone desirous of acquiring information concerning workshop procedure will find this a useful guide. Appreciating the needs of the learner Mr. Avery imparts a knowledge of the broad principles underlying the various types of armature winding, and so enables a start to be made with confidence. The many causes of failure, arising from faulty procedure, unsuitability, and so on, are adequately explained. The chapter on insulation is particularly good, and a useful "Armature Winder's Reference Table" is given. Though well prepared, the publishers would have done better to set up this table in type. Throughout the book there are many excellent diagrams and well-selected, carefully reproduced photographs.

To show the range covered by the book the chapters on preparing connection diagrams, insulation, insulating the armature, hand and former windings, doping and baking-out may be specially mentioned. Altogether this may be classed as one of the best books of its kind and it should find a place particularly on the shelves of those engaged in the rewinding and repair of small armatures.

Automatic Protective Gear for A.C. Supply Systems. By J. Henderson. Pp. 201; figs. 117. London: Sir Isaac Pitman & Sons. Price 7s. 6d. net.

Protective systems are now so numerous that it has become urgently necessary that descriptions of them should be collected together, their working explained in terms of fundamental principles, their fields of application defined and their relative merits discussed critically. All this cannot be done in a single volume, and the book under review does not attempt to cover the whole field. The emphasis is placed on compilation and description rather than on the explanation of fundamental principles, and for many systems a diagram of connections is regarded as as self-explanatory. The mathematical and quantitative aspects of the problem, though of vital importance, cannot find much room within the scope which the author has set himself, but where an explanation of the basic working principle of a protective system is attempted it is done thoroughly, and gains an added value from many shrewd observations drawn from operating experience.

In the first sentence of the introduction Mr. C. W. Marshall tells us that interconnection of electricity supply lines is essential in order to ensure minimum conductor losses—a strange reason to single out as the only one worth mentioning!

The book itself is not altogether free from misleading statements. The reason for neutral earthing given on page 26 is that capacity currents in cables are heavy enough to cause damage, and we are told on page 30 that reactances have not been used for neutral earthing because of the danger of resonance. The true reason for neutral earthing, namely, the danger to insulation from arcing earths, and the almost universal employment of reactances in Central Europe to meet this danger, are not mentioned. The statement on page 34 that earth-leakage protection should only be installed where discriminating properties are not required is also misleading, and partly refuted a few pages later where restricted earth leakage is described. Fig. 30 and the accompanying description hardly do justice to Whitcher's and other pioneer works in compensating for pilot capacity and overcoming other defects of pilot protection. From what is said the student would never gather that this work covered the use both of balancing capacities and balancing reactances, and, moreover, forstalled in principle every subsequent biasing system. But such shortcomings are not numerous enough to prevent the book as a whole from providing most valuable help and guidance to every engineer connected with protective problems.

Electrical Engineering. Vol II, Alternating Currents. (Third edition.) By C. L. Dawes. Pp. 705; figs. London: McGraw-Hill Publishing Co. Price 24s.

The last revision of this work occurred in 1928, since when many developments need to be recorded. Vacuum tubes and gaseous rectifiers have become of greater importance with regard to communications, power control devices, and for the conversion and inversion of large amounts of power. The chapter on vacuum tubes now includes such developments as tetrodes and pentodes and their applications, while a new chapter on rectifiers has taken the place of photometry.

The bulk of the book, however, is devoted to heavy a.c. work, alternators, transformers, induction and synchronous motors and convertors and transmission. The new sections here include high-starting-torque motors of the induction and synchronous types, the double-cage motor, the synchronous-induction motor, and capacitor motors. The problem in compiling a book of this kind is to know what to put in and what to leave out. We find no mention of the cathode-ray oscillograph alongside the earlier galvanometer type. Also the only a.c. bridge dealt with is the impedance type. Again, the theory of harmonics is scarcely touched, while the composition of the magnetomotive force of windings receives but scanty treatment, though there are frequent references to it throughout the text. Attention is drawn to these points to show that the book is really a compendium of a.c. technology. It will be of use to beginners and to those who are not interested in specialist treatises. The chapters on vacuum tubes and rectifiers give an interesting survey of these wide subjects.

Useful data in appendices and questions and problems on the several chapters are included. The problems are given without answers, which is a drawback from the point of view of private study. While the book contains much valuable information, it is scarcely the style regarded as a textbook in this country. It will be probably the better appreciated as a reference book by engineers in practice.

Torsional Vibration—Elementary Theory and Design Calculations. By W. A. Tuplin. Pp. 320; figs. 89. London: Chapman & Hall. Price 21s.

The subject of torsional vibration is one that has recently received much attention owing to its increasing importance in connection with modern machinery and owing also to its bearing on failures of crankshafts, &c., within the last few years. In this volume, the author has presented the problem, mainly as it meets the designer, in a practical light, and has shown how it is to be solved.

The fundamental principles of torsional vibration are simple, both in their conception and in their mathematical expression, and, as in their most elementary form the motions are simple harmonics, the introductory formulæ will be very familiar to the electrical engineer. He will, however, have to attune his view of them to the fact that they are applied here to oscillating masses, elastic properties of materials and the mechanical forces which cause or impede motion.

The general principles have been fully stated and explained without the use of the higher mathematics, and by progressively numbering all important formula the author has made it easy, both for himself and his reader, to refer back to the fundamental argument on which later developments are based. Following up this, he explains in detail how actual shafts and the armatures, flywheels, couplings, &c., which they carry are reduced to simple equivalent dynamical systems to which the fundamental formulæ may be readily applied.

The subsequent treatment of various mass systems is orderly and lucid, and includes such examples as a Diesel-electric drive and a geared drive, both of which are of interest to the electrical engineer. Altogether the book is to be regarded as a valuable contribution to this important subject.

High Voltage Physics. By L. Jacob. Pp. 104; figs. 37. London: Methuen & Co., Ltd. Price 3s.

This little book is one of a series of monographs on physical subjects, and its object is to bring together facts and definitions connected with high-voltage phenomena. Reference to it may save time for those who wish to pursue the matter, because it indicates the direction in which search for information should be made and contains a good bibliography.

After the production of high voltages and their measurement has been considered in the first chapter, the bias is largely abstract. High-voltage electrons, positive ions, and air, solids, liquids and vacua as dielectrics receive adequate treatment. The survey of gaseous dissociation and dielectric phenomena is well done and is valuable in the light of recent developments in high-voltage transmission and of arc rectifiers, and the production of h.v. cathode-ray oscillographs by which to study such phenomena. For this reason, it is regretted that space did not permit greater consideration of electric fields, which receive only four pages.

The statement on page 55, that humidity of itself has no effect upon the starting voltage of corona, except in so far as

A battery of Siemens projector units being loaded at the company's Dalston works en route to Westminster for the floodlighting of the Clock Tower of the Houses of Parliament. There are 120 of these, each fitted with a 1,000-W lamp

it lowers the air density, seems to require qualification, because the existence of natural humidity as an independent entity that does not affect other atmospheric phenomena cannot occur outside the laboratory.

The book would be improved by the abandonment of the supposition that any formula is well known and does not require its symbols to be explained in the text. Some of the diagrams are not lettered for such a degree of reduction and are hard to read; this apart, the book is well presented, and can be recommended for quick reference purposes.

Electric Wiring (Fourth edition). By W. S. IBBETSON. Pp. 253; figs. 132. London: E. & N. F. Spon, Ltd. Price 6s.

This comprehensive little text book is excellently adapted for evening class pupils and for workmen as an introduction to the principles of wiring. It is particularly suited to the requirements of those studying for the B course of the City and Guilds of London Institute. The new edition has brought the work right up to date by embodying numerous references to the tenth edition of the I.E.E. Regulations, and it deals more fully with alternating currents than its predecessors.

Among the branches of the subject dealt with are illumination, batteries, bells, dynamos, motors and instruments. The treatment of these supplementary subjects is necessarily slight but suited to the purposes of a class primer. In the section on bells more details of the modern application of transformers would have been appreciated by the practical reader. In the two or three chapters devoted particularly to wiring, operatives would benefit by further instruction on the layout of circuits, especially for the combined rate installations, in which case provision has to be made in the smallest houses for water heaters, cookers, radiators, wireless sets and clocks. Perhaps the important subject of continuity might have been even more emphasised, and students' attention drawn to the fact that the devices provided by the manufacturers of most metal-sheathed systems very inadequately meet the real requirements. The author sometimes uses the description "positive or unearthed" cable in places where "live" cable would be more generally correct. It is odd how often even experienced wiremen persist in regarding all live wires as "positive," the reason being that so many text books still employ the older and convenient "positive and negative" designations when describing details of circuits, although in practice now the terms often lead to confusion and wrong connections. The book is adequately illustrated and provided with numerous practical solutions of everyday problems.

* * *

Shorter Notices

"Definitions and Formulæ in Radio Engineering for Students," by A. T. Starr. Pp. 35; figs. 23. London: Sir Isaac Pitman & Sons, Ltd. Price 6d.

"Principles of Alternating Currents," by R. R. Lawrence. (Second edition.) Pp. 475; fig. 140. London: McGraw-Hill Publishing Co., Ltd. Price 24s.

"A Symposium on Illumination." Edited by C. J. Webber Grieveson. Pp. 229; figs. Price 13s. 6d. "Introduction to Electric Transients," by E. B. Kurtz and G. F. Corcoran. Pp. 335; figs. Price 22s. 6d. London: Chapman & Hall, Ltd.

Electrical Imports of Australia

Last year's improved tendency

IN the recently issued annual statement of the overseas trade of Australia interesting details are given for 1933-34 of the imports of electrical goods, indicating countries of origin. The values of the principal items are shown below, together with a note of the increase or decrease compared with 1932-33. Exact comparison is not possible in the case of the dynamo and lamp groups because of the changes in classification made in the course of the 1932-33 fiscal year. It is evident that the recovery which set in during that period gained headway in 1933-34. The total trade, however, is far below the level of five years previously and it is considered unlikely that it will ever regain that level. The total value of the imports into the Commonwealth of electrical machinery and appliances, including covered cable and wire, in recent years have been: 1928-29, £6,127,000; 1929-30, £6,101,000; 1930-31, £2,842,000; 1931-32, £1,201,000; 1932-33, £1,422,000; and 1933-34, £1,635,000, while for the six months ended in December last the figure was £1,233,000.

	1933-34. £	Inc. or dec. £
Dry cells—		
Total	1,600	+ 200
From United Kingdom	700	+ 500
„ United States	800	− 100
Storage batteries for radio sets—		
Total	100	− 100
Storage batteries for motor vehicles—		
Total	3,500	− 9,500
From United Kingdom	1,100	− 6,900
„ United States	2,400	− 2,200
Other batteries and parts—		
Total	11,700	+ 7,400
From United Kingdom	3,700	+ 1,900
„ United States	7,900	+ 5,400
Cables and wire (cotton covered)—		
Total*	7,300	− 3,000
Cable, telegraph and telephone, paper-insulated, lead-covered—		
Total*	700	− 2,300
Other telegraph and telephone cable—		
Total	13,300	+ 7,300
From United Kingdom	10,000	+ 4,000
„ Germany	3,000	+ 3,000
Light and power cable, paper-insulated, lead-covered—		
Total*	21,000	+ 5,000
Other cable and wire—		
Total	412,000	+ 72,000
From United Kingdom	348,000	+ 55,000
„ United States	27,000	+ 10,000
„ Germany	9,700	− 3,800
„ Canada	4,000	+ 3,300
„ Japan	3,700	+ 3,500
Carbon manufactures—		
Total	46,000	+ 7,000
From United Kingdom	19,000	+ 5,000
„ United States	11,000	+ 1,000
„ Germany	13,000	+ 2,000
„ France	2,000	− 800
Motors under 1 h.p. (separate)—		
Total	32,000	+ 500
From United Kingdom	20,000	+ 600
„ United States	9,500	− 500
„ Germany	1,200	− 300
Induction coils h.v.—		
Total	21,000	+ 6,000
From United Kingdom	7,200	+ 1,300
„ Canada	4,800	+ 3,100
„ United States	8,800	+ 1,100
Fans, electric—		
Total	6,300	+ 3,300
From United Kingdom	2,500	+ 2,200
„ Italy	3,400	+ 1,000
Dynamos, a.c., induction—		
Total	43,000	†
From United Kingdom	28,000	—
„ United States	8,500	—
Dynamos, a.c., variable speed, commutator type—		
Total	2,400	†
Dynamos, a.c., other—		
Total	32,000*	†
D.C. traction motors—		
Total	1,500*	†
Other d.c. dynamo-electric machines—		
Total	84,000	†
From United Kingdom	71,800	—
„ Germany	4,700	—
„ United States	6,000	—
Other dynamo-electric machines—		
Total	15,000	†
From United Kingdom	9,900	—
„ Germany	1,900	—
„ United States	2,900	—
Convertors, motor and rotary—		
Total	3,300	†
Lamps, filament, automobile—		
Total	31,000	‡
From United Kingdom	10,200	—
„ Japan	2,900	—
„ Holland	17,600	—
Lamps, under 20 v, including torch and flashlight—		
Total	12,200	‡
From United Kingdom	7,300	—
„ Japan	2,000	—
Lamps, 20 v, and over, gasfilled—		
Total	48,000	‡
From United Kingdom	41,100	—
„ Holland	2,700	—
Lamps, 20 v, and over, other—		
Total	37,000	‡
From United Kingdom	23,000	—
„ Japan	10,000	—
Fittings and accessories—		
Total	24,000	‡
From United Kingdom	12,000	—
„ Germany	2,700	—
„ Japan	4,900	—
„ United States	5,000	—
Switches, fuses and lightning arrestors—		
Total	65,000	+ 6,000
From United Kingdom	41,000	+ 2,000
„ Germany	7,600	+ 1,200
„ United States	12,400	+ 1,400
Heating, cooking and domestic appliances—		
Total	8,800	+ 3,800
From United Kingdom	2,900	+ 1,500
„ United States	3,000	+ 2,100
„ Canada	2,500	+ 200
Measuring and recording instruments—		
Total	60,000	+ 15,000
From United Kingdom	35,000	+ 26,000
„ Switzerland	6,600	+ 1,300
„ Germany	4,000	− 3,400
„ United States	12,200	+ 1,300
Regulating and controlling apparatus—		
Total	53,100	+ 18,900
From United Kingdom	33,000	+ 18,800
„ Switzerland	1,100	− 500
„ Canada	500	− 600
„ United States	15,300	+ 1,400
Static transformers, 66,000 v and under—		
Total	3,100	+ 1,600
From United Kingdom	1,300	+ 300
„ United States	1,100	+ 800
Static transformers, over 60,000 v.—		
Total*	—	− 1,000
Telegraph instruments and appliances—		
Total*	7,700	+ 6,000
Telephones—		
Total	43,000	+ 20,000
From United Kingdom	40,000	+ 19,000
Telephone switchboards and appliances—		
Total	71,000	+ 43,000
From United Kingdom	66,000	+ 42,000
„ Belgium	500	− 900
„ Germany	—	—
„ United States	3,100	+ 1,100
Vacuum tubes, electrical—		
Total	12,500	+ 800
From United Kingdom	3,100	− 1,700
„ Holland	3,700	+ 1,000
„ United States	5,500	+ 1,500
Radio tubes—		
Total	191,000	− 140,000
From United Kingdom	49,000	+ 3,000
„ Holland	12,000	− 79,000
„ United States	125,000	− 68,000
Radio receiving sets, accessories and parts—		
Total	54,000	+ 13,000
From United Kingdom	16,000	+ 7,700
„ Germany	1,000	− 1,700
„ Holland	500	− 100
„ United States	32,000	+ 7,000
Electrical appliances, n.e.i.—		
Total	122,000	− 27,000
From United Kingdom	61,000	− 8,000
„ Canada	900	+ 300
„ Germany	7,400	− 17,600
„ United States	42,000	− 3,600
„ Japan	6,000	+ 3,000
Electrical ware of earthenware, including insulators—		
Total	13,500	+ 4,500
From United Kingdom	2,700	+ 1,300
„ France	4,300	+ 300
„ Germany	3,700	+ 1,900
„ Japan	1,300	+ 700
Electrical insulating paper and boards—		
Total	11,600	+ 600
From United Kingdom	8,100	+ 2,300
„ United States	1,600	− 200

* Mainly from United Kingdom. † Compares with six months only of previous year. ‡ Compares with nine months only of previous year.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Electric Traction Arrangement

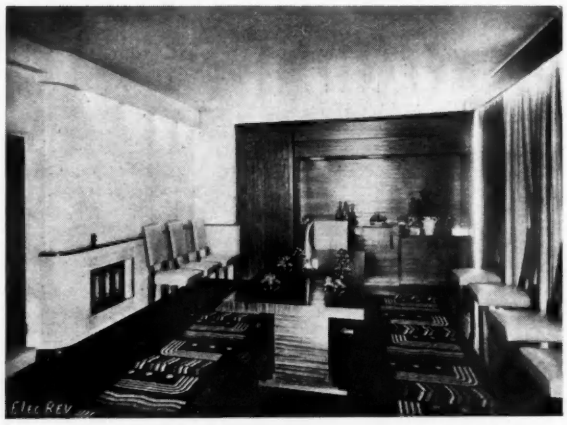
We understand that a new company has been registered under the title "Associated Manufacturers of Electric Traction Equipments, Ltd." It is learned that certain manufacturers have decided in agreed cases to pool information and technical designs to assist in the standardisation of the electrical equipment for rolling stock in this country, without, however, interfering with manufacture of this class of apparatus in the works of the various firms interested. For that purpose the new company has been registered and the following companies are jointly interested in it: The British Thomson-Houston Co., Ltd., Crompton Parkinson, Ltd., Allen West & Co., Ltd., the English Electric Co., Ltd., the General Electric Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd. The operations of the Associated Manufacturers of Electric Traction Equipments, Ltd., will be limited to dealing with the electrical equipment for rolling stock and will not apply to any other class of apparatus.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that there will be no "cost-of-living" alteration in wages on the third pay-day in May.

Domestic Lighting Up to date

Modern styles of domestic architecture provide innumerable opportunities for originality with regard to the installation of lighting and other electrical appliances, and it is only recently that people have begun to realise the possibilities offered by "built-in" illumination for decorative purposes. A



The dining-room at West Heath Close, Hampstead

recently completed house designed by Mr. R. A. Duncan at West Heath Close, Hampstead, provides an excellent example of how cornice and lay-lighting systems can be planned to fit in with the general architectural scheme and also harmonise with the furnishing. Our illustration shows one end of the dining-room of which a built-in electric fire on the left and the sideboard with circular lay-lights above are prominent features. The right-hand cupboard of this sideboard is asbestos-lined and fitted with a hotplate to keep warm food placed there from the adjoining servery. In the lounge, which is connected by folding doors with the dining room, extensive use has been made of colour lighting, and a bank of lay-lights has been installed outside the doors leading on to the garden. The electrical installation was carried out by Messrs. Fred. L. McGhee & Co., Messrs. F. G. Vosper & Co. being responsible for the electric fires.

Dutch Lamp Imports

It is announced from the Hague that the restriction in the imports of incandescent lamps has been extended for one year as from May 1st. The quota percentages remain unchanged.

Some Cooking Hints

In the course of a recent lecture on "Electric Cooking Apparatus," by Mr. J. R. Laird, superintending engineer of Carron Company, different types of foodstuffs, their compositions and values, and methods of cooking were dealt with. It was explained why the use of high temperatures was wasteful and why "boiling" was an unfortunate term. For instance, eggs placed in water at 175 and 212 deg. F. for twelve minutes would become solid throughout at both temperatures; but that cooked at the lower temperature would be tender whereas the higher temperature would cause the other to be dense and leathery. High temperatures should be avoided when roasting and baking, except for a few minutes at the outset to seal the exterior. Some points in cooker hotplate and oven design were considered.

Exhibitors at Bournemouth

It is evident from the list of the firms who are to participate in the National Electrical Convention Exhibition at Bournemouth in June that the display will be fully representative. Apart from associations and the local electricity supply company over sixty manufacturers of domestic and general electrical equipment will have stands. The exhibition is to be held in the Winter Garden and in an adjacent marquee. The following firms are exhibiting:—

Aidas Electric, Ltd.
Arrow Switches, Ltd.
Automatic Electric Co., Ltd.
Automatic Light Control.
Bastian & Allen, Ltd.
Belling & Co., Ltd.
Benjamin Electric, Ltd.
Berry's Electric, Ltd.
Bournemouth & Poole Electric Supply Co., Ltd.
Bray, G., & Co., Ltd.
British Electrical Development Association.
British National Electrics, Ltd.
British Sangamo Co., Ltd.
British Thomson-Houston Co., Ltd.
Bulpitt & Co., Ltd.
Burnley Components, Ltd.
Carron Company.
Church & Co., Ltd.
Corfield Sigg, Ltd.
Drake & Gorham, Ltd.
Edison Swan Electric Co., Ltd.
Electric Lamp Manufacturers' Association.
Electrical Association for Women.
Electrical Contractors' Association (Bournemouth Branch).
Electric & Musical Industries, Ltd.
English Electric Co., Ltd.
Falk, Stadelmann & Co., Ltd.
Falkirk Iron Co., Ltd.
Ferranti, Ltd.
Furn-Art, Ltd.
General Electric Co., Ltd.
Green, G., & Co.
Greene, Phillips & Co.
Hague & McKenzie, Ltd.
Hanovia, Ltd.
Harcourts, Ltd.
Hawkins, L. G., & Co., Ltd.
Heatrae, Ltd.
Holophane, Ltd.
Hoover, Ltd.
Horstmann Gear Co., Ltd.
Hotpoint Electric Appliance Co., Ltd.
Jackson Electric Stove Co., Ltd.
Johnson & Phillips, Ltd.
Leda Electric, Ltd.
Low, Archibald, & Sons, Ltd.
McGregor & McCullum.
Manor Electric Oven & Fire Co.
Measurement, Ltd.
Metropolitan-Vickers Electrical Co., Ltd.
Moffats, Ltd.
Radiovisor, Ltd.
Revo Electric Co., Ltd.
Reyrolle, A., & Co., Ltd.
Rheostatic Co., Ltd.
Santon, Ltd.
Scholes, G. H., Ltd.
Siemens Bros. & Co. Ltd.
Siemens Electric Lamps & Supplies, Ltd.
Simplex Electric Co., Ltd.
Stokes Appliances, Ltd.
Sun Vic Controls, Ltd.
Thomas, Bertram, Ltd.
Tricity Cookers, Ltd.
Unity Heating, Ltd.
Venner Time Switches, Ltd.

Change of Name

Electric Fires, Ltd., of Norwich, has changed its name to Heatrae, Ltd.

A Simplex Development

The Simplex Electric Co., Ltd., informs us that the Mersey Cable Works, Ltd., is now one of its associated companies, and the Simplex selling organisation, which comprises fifteen directly controlled branches in various large centres, is now in a position to give deliveries and all necessary service in connection with Mersey cables. In a circular letter Mersey Cable Works, Ltd., states that the management of the company remains unchanged in the hands of Mr. W. S. Taylor as managing director, and future inquiries may be directed either to the company or to the Simplex Electric Co., Ltd.

Brussels International Exhibition

At the Brussels International Exhibition which opened during the current week one of the most interesting sections is the Palace of Science, every visitor to which is automatically counted by means of photo-electric cell apparatus. The Palace of Science has been named the Alberteum after the late King Albert, and the whole of the proceeds, after deducting a percentage due to the Exhibition itself, are to be devoted to a fund for the construction of the Albertine Library which is being formed to assist scientific research. The Palace of Science covers two and a quarter acres of land, and there is 81,000 sq. ft. of exhibition space. Wireless and cinematograph theatres and lecture halls and a broadcasting studio are included, and a Planetarium has been constructed as a permanent acquisition to the City of Brussels. A section of the Palace of Science is devoted to marine wireless developments. This is being undertaken by the Comité International Radio Maritime, an international organisation of wireless companies responsible for the administration of wireless services on board ship.

Australian Tariff on Heating Units

An inquiry is being held by the Australian Tariff Board into the duties on heating units for three types of apparatus: those for use in plating and similar chemical baths, for melting pots and furnaces, and for electric ovens for bakeries. These come under by-law item 415A (2) and the Board is inquiring into the question of their removal from the by-law, and, if they are removed, what rates of duty should be levied. At present they are allowed in free under the British preferential tariff, the general tariff being 15 per cent. *ad valorem*. Mr. A. Stuart, director of Hecla Electrics Pty., Ltd., Melbourne, said his company was in favour of the removal from the by-law of heating units for bakery ovens and of the imposition of a duty of 32 per cent. British and 52 per cent. general—the same as for electric heating and cooking appliances. His company contended that such units were economically manufactured in

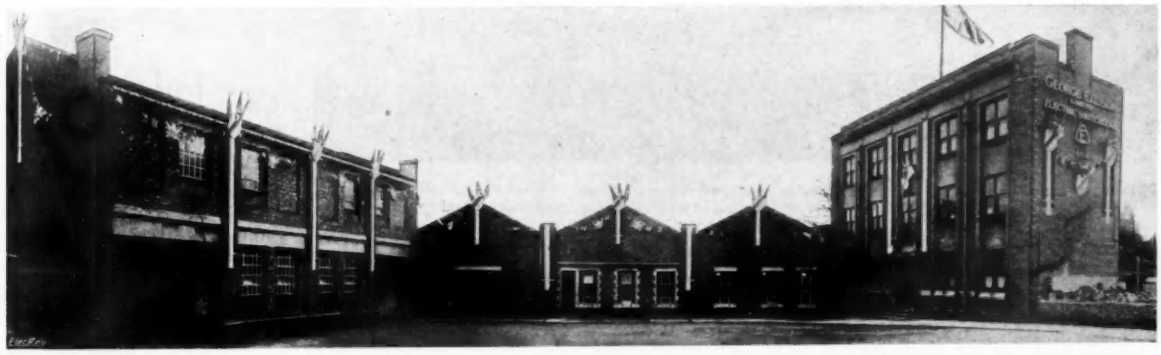
Australia and that their admittance under the by-law unfairly penalised Australian productions. His company made units principally 26 in. long and 2¼ in. diameter, and each was loaded to 750 W. They also made units of various lengths and loadings to suit other makes of ovens.

Crompton Lamp Wholesalers' Conference

On April 24th Crompton Parkinson, Ltd., entertained more than 100 Crompton lamp wholesalers from the London district at a dinner and conference at the Quadrant Restaurant, Regent Street. Mr. T. H. Windibank, who was in the chair, outlined the history of the company in the lamp field and its plans for the future. He explained how, at the time when the Crompton lamp was introduced, commercial and technical investigations were made in all the lamp producing countries of the world and the foundation of the Crompton lamp business was based on conclusions resulting from these investigations. The success that attended the project was proved by the fact that the new factory at Guiseley had been extended twice in less than three years, and that a large glass works had been built and equipped and had been in full production for more than twelve months. He then turned to the broader aspect of the subject of lighting and spoke of the work of two American professors who had been investigating the "science of seeing" along somewhat new lines. The American standard of lighting, judged by the eyes' needs was not a high one, but it was more than twice as good as the standard in this country. At the conclusion of Mr. Windibank's speech Mr. J. W. Hunwick, of the London Electrical Co. (Sherborne Lane), Ltd., and Mr. John Godden, of John Godden & Co., Ltd., spoke on behalf of the visitors. Telegrams were sent wishing Col. Crompton many more years of health and activity and congratulating Mr. Frank Parkinson upon the enterprise of his company in arranging the dinner and conference.

Ellison's Jubilee Decorations

The accompanying picture sent us by Messrs. George Ellison, Ltd., shows the company's works which have been decorated for the forthcoming Jubilee celebrations. The scheme of decorations includes 300 yds. of bunting, 200 flags, 1,800 yds. of pennons, 700 coloured lights and 750 ft. of cable.



The works of Messrs. George Ellison which have been decorated in connection with the forthcoming Jubilee celebrations

Orders Recently Booked

Among other contracts Messrs. J. Browett Lindley (1931), Ltd., have recently secured an order for a motor-driven two-stage air compressor which will be installed at the Pretoria workshops of the South African Railways and Harbours Co., Ltd. The compressor will be capable of delivering 2,000 cu. ft. of free air to a pressure of 100 lb. per sq. in., and will be driven by a motor of the synchronous induction type supplied by the Electric Construction Co., Ltd.

The British Electric Transformer Co., Ltd., has received through its agents, Messrs. A. & T. Burt, Ltd., of Wellington, N.Z., an order for transformers from the New Zealand Public Works Department. It comprises seven 8,000-kVA, 11,000/110,000-V single-phase transformers, to be coupled in two banks of three, with one spare, for the Arapuni power scheme. The transformers will be employed to step up the generating voltage to the voltage of the main grid system.

Key Industry Duties

The Board of Trade has appointed Sir Geoffrey Ellis, Bt., M.P. (chairman), Brig.-Gen. Sir Harold Hartley, C.B.E., F.R.S., Mr. W. Benton Jones, and Sir Allan Powell, C.B.E., to be a Committee to consider the position that will arise on the expiry on August 19th, 1936, of the duties imposed under Part 1 of the Safeguarding of Industries Act, 1921, as amended by the Finance Act, 1926, and to report whether, and how far, in the interests of Imperial defence, and having regard to the provisions of the Import Duties Act, (a) the various duties now in force should be continued, and if so, at what rates of duty; and (b) duties should be imposed on articles not coming within the scope of the present duties, and if so at what rates of duty. Mr. W. H. L. Patterson, Board of Trade, has been appointed secretary to the Committee.

Factors' New Sheffield Branch

Messrs. Hobday Bros., Ltd., are opening a new electrical and radio depôt and showrooms at Caulston Street, Snigg Hill, Sheffield, to serve the Yorkshire, Nottinghamshire and Lincolnshire districts, and a fleet of new delivery vans is now being fitted with specially constructed bodies to meet the company's requirements. Mr. F. C. Dixey, previously manager of the company's Wolverhampton branch, will be in charge of the new depôt, but the area will continue to come under the supervision of Mr. F. Ready, of Manchester, in his new capacity of northern area manager. The management of the Wolverhampton branch has been taken over by Mr. J. H. Hale. The business of the subsidiary company, Express Radio Factors, Ltd., Sheffield, will be transferred with the entire staff on the opening date to the new premises of the parent company. Mr. H. Johnson, manager of Express Radio Factors, has been appointed sales manager of the new Hobday branch.

Calendar

The calendar for 1935-36 received from Messrs. Bruce, Peebles & Co., Ltd., has a picture of Tantallon Castle in three colours. It dates from May, 1935, to April, 1936, and has monthly tear-off sheets, which also show the preceding and following months. Each sheet has illustrations of the company's products.

Safety Congress

At the National Safety Congress at the Park Lane Hotel, London, on May 31st there will be a joint session with the Association of Public Lighting Engineers and the Illuminating Engineering Society. Mr. S. B. Langlands, a vice-president of the Society, will speak on recent developments in street lighting in relation to safety. Miss C. Haslett will preside at the home safety session when Prof. Winifred Cullis will speak on "Prevention is Better Than Cure."

An Electric Crematorium Furnace

The Cemetery Committee of Croydon Corporation proposes to build a crematorium at its Mitcham Road Cemetery. The Minister of Health has approved the scheme in principle, but suggests that tenders should be invited for the furnace. The estimate of £6,000 submitted to the Minister for the purpose of loan sanction included an item of £1,300 for a gas fired furnace, but the Committee has since had under consideration the question of providing, instead, an electric furnace. At the present time no electric furnaces have been operated in a crematorium in Great Britain, but such furnaces are in use in Germany and Switzerland, and it is claimed that they have certain advantages as compared with a coke or gas fired furnace. A quotation has been obtained from Birmingham Electric Furnaces, Ltd., for the supply and installation of an electric furnace at the price of £1,400. The Committee is convinced that this firm, which is manufacturing an electric cremation furnace for another local authority, has had considerable experience in the manufacture of all types of large electrically heated furnaces and that its specification has been prepared with knowledge of the experience gained in the use of similar furnaces in Germany and Switzerland.

A description of an electric crematorium recently built at Erfurt, Prussia, appeared in the ELECTRICAL REVIEW of April 12th.

Registered Electrical Contractors

The National Register of Electrical Installation Contractors has issued a booklet containing a list of contractors on the National Register at January 1st last. This contains the names of over 1,700 contractors in all parts of the British Isles, and in addition to an alphabetical arrangement of the names there is a geographical classification.

Accumulator Production in Jugo-Slavia

It is reported from Zagreb that the recently formed company, the "Munja" A.G., has started in that city the first accumulator works in Jugo-Slavia.

Liability for Electricity Accounts

In a leaderette bearing this title in our issue of April 19th we referred to the fact that the Birmingham Electric Supply Department will accept the deposit of bearer bonds as a guarantee when giving a supply to limited companies. Apropos of this the Trade Indemnity Co., Ltd., 8, Waterloo Street.

Birmingham, says that another form of guarantee is the insurance bond which can be secured at a comparatively nominal cost.

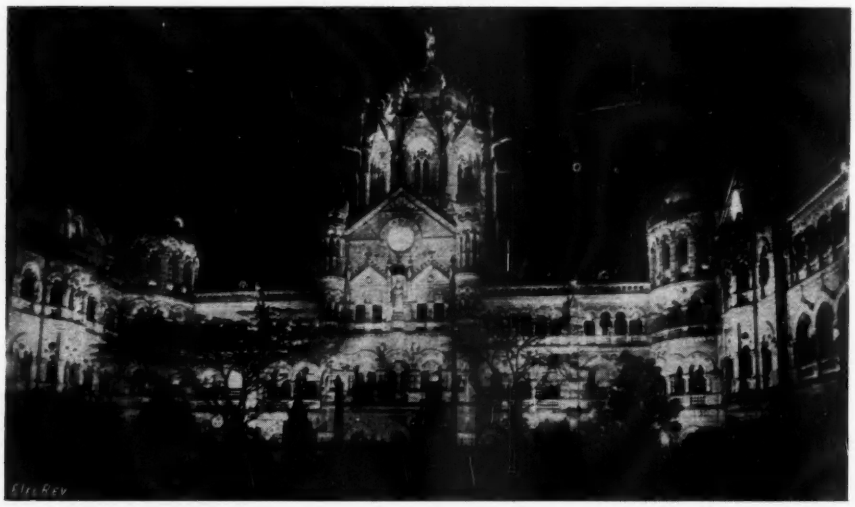
Trade Announcements

Messrs. Johnson & Phillips, Ltd., have removed their Ipswich branch to larger premises at Park Chambers, Tower Street, Ipswich. (Telephone No. 3417; telegrams: "Selbac, Ipswich.")

Messrs. Ferranti, Ltd., inform us that in future communications concerning radio matters should be addressed to Radio Works, Moston, Manchester, 10, and not Hollinwood, as hitherto. This applies to all correspondence relating to radio with the exception of such mail as has in the past been addressed to the company's Bush House offices, which will continue as formerly.

L. E. S. Distributors, Ltd., has opened a branch at 48, Uxbridge Road, Ealing, W.5 (telephone: Ealing 0351).

Mr. C. P. Swan, late of Johnston & Swan, electrical and radio engineers, of 25a, Parchment Street, Winchester, has commenced business on his own account, at Durngate, in that city.



The Victoria Terminus, Bombay, which has been floodlighted in connection with the Jubilee celebrations. Twenty-four floodlights of 2,000 c.p. each are used

Prices of Materials

Messrs. Frederick Smith & Co. report, May 1st: No change in the price of electrolytic copper bars, wire rods and h.c. wire and silicium bronze wire.

Messrs. Henry Gardner & Co. report, May 1st: No change in the price of copper bars (best selected), sheet and rod. English pig lead, £15, 10s. increase.

Messrs. Edward Till & Co. report, May 1st: No change in the price of India-rubber, Para fine.

New Municipal Showrooms and Offices

Sunderland Corporation Electricity Committee has approved plans for new offices and stores for the Electricity Department at an estimated cost of £38,000. The new buildings will be erected on a site recently acquired in Queen Street, adjoining the existing offices and stores.

The Exeter Corporation Electricity Committee has recommended a scheme prepared by Mr. J. Bennett, the city architect, for the adaptation of premises in Fore Street as electricity offices and showrooms at a cost of £11,500.

A Jubilee Gift to Employés

In connection with the Jubilee celebrations Tungstalite, Ltd., is presenting all its employés with the sum of £1. The company is supplying all the lamps for the illumination of H.M.S. *President*.

"K. & K." Publicity

We have received from the Kensington and Knightsbridge Electric Lighting Co., Ltd., a handsomely produced brochure, in colour, which it has prepared for issue to its consumers. This contains a list of tariffs under which electricity supply can be obtained, together with information of the extensive service which is offered by the company both in connection with the hire of electrical apparatus and advice generally in all electrical matters. There are sections on lighting, heating, cooking, water heating, refrigeration and other domestic uses of electricity, each of which includes well-chosen illustrations of the apparatus dealt with, while attention is drawn to the company's up-to-date showrooms in Brompton Road, S.W., where all the apparatus mentioned can be seen and where daily cooking demonstrations are given by competent lecturers to audiences of consumers and "prospects."

Vacuum Cleaner Factory Extension

The factory of Hoover, Ltd., is to be nearly doubled to cope with the demand for the Hoover Junior electric cleaner. At present the factory covers 112,000 sq. ft. When the extensions are complete it will cover well over 200,000 sq. ft. The extensions will take the form of four additional storeys running parallel with the main part of the building, which faces the Western Avenue, Perivale. There will also be a one-storey extension by the side of this. The factory, when the extensions are completed, will form a "U" with an open courtyard between the front and back wings.

The Pewterers' Company's Dinner

Lord Hirst proposed the toast of "The Company," at a dinner of the Pewterers' Company held at the Leathersellers' Hall, E.C., on April 26th, to which Mr. H. Justus Eck, the Master, who presided, replied. Among others present were Mr. H. Marryat, Mr. H. Hepworth Thompson (president of the Illuminating Engineering Society), and Professor C. L. Fortescue.

For Sale

Messrs. Goddard & Smith will sell by auction on May 15th at 13, High Holborn, W.C., the stock of an electrical warehouse. (See our classified advertisements.)

Trade with Latvia

A firm of agents in Riga, Latvia, wishes to get into touch with British exporters of electrical goods to Latvia. We will forward any communications addressed to the firm c/o The Editors.

Approved Flameproof Mining Gear

THE list of electrical apparatus for which certificates of flameproof enclosure have been granted by the Mines Department during the three months ended March 31st, 1935, includes the following:—

British Jeffrey-Diamond, Ltd.—D.c. coal cutter motor with rectangular enclosure, and combined squirrel-cage conveyor motors and switches of various arrangements and sizes.

British Thomson-Houston Co., Ltd.—Air-break push-pull switch fitted with rectifier and resistance; moving iron controller instruments; draw-out oil circuit-breaker, alternatively arranged; small squirrel-cage motors with alternative cable attachments; air-break drill unit; slip-ring induction motor; and oil-immersed and star-delta starters.

Cowlishaw, Walker & Co.—Squirrel cage "Senior" coal cutter.

Electrical Apparatus Co., Ltd.—Inductor control panel motor starter, and star-delta starter, variously arranged.

George Ellison, Ltd.—Relay adaptor box for air-break gate-end circuit-breaker, and four-way cable link box.

English Electric Co., Ltd.—Slip-ring and squirrel-cage motors of various capacities and sizes.

Ericsson Telephones, Ltd.—Generator contact and receiver switch enclosures.

Ferranti, Ltd.—Controller instruments, moving iron and moving coil types.

General Electric Co., Ltd.—Draw-out circuit-breaker.

Hardypick, Ltd.—Tubular motor-generator gate-end box.

Austin Hopkinson & Co., Ltd.—A.c. haulage units of various sizes and a.c. coal cutter.

Johnson & Phillips, Ltd.—Transformer tank, single phase.

Lancashire Dynamo & Crypto, Ltd.—"Fankuld" slip-ring motors of various sizes and arrangements; alternative slip-ring enclosures for "Maxtorq" induction motor.

M. & C. Switchgear, Ltd.—Remote control gate-end box, variously arranged.

Macintosh Cable Co., Ltd.—Cable adaptor box and well-glass fitting, both for lighting.

A. Reyrolle & Co., Ltd.—Flit plug connector.

Siemens-Schuckert (Great Britain), Ltd.—Well-glass lighting fitting and variously arranged drill transformer panel.

Switchgear & Cowans, Ltd.—Receiving plugs and socket connectors.

Hugh Wood & Co., Ltd.—A.c. "Huwood" coal-cutter motor and starter.

Certificates Nos. 303 and 304, cable coupling and 4-way junction boxes (Macintosh Cable Co., Ltd), and Nos. 317 and 318, s.c. induction motor and slip-ring enclosure (Mather & Platt, Ltd.) have been extended to cover the use of the apparatus in atmospheres other than firedamp.

New Catalogues and Lists

Cooper & Smith, 14, Chicheley Street, York Road, S.E.1.—A leaflet on a two-tier lighting pendant.

Bruce Peebles & Co., Ltd., Edinburgh.—Leaflet on the salient features of "Peebles" transformers, and particulars of converting plant.

English Electric Co., Ltd., Stafford.—A catalogue of four-stroke Diesel engines and leaflets dealing with fractional h.p. motors and metal-clad switchgear.

Hackbridge Electric Construction Co., Ltd., Walton-on-Thames.—A brochure on Hackbridge transformers.

McLeod & McLeod, Ltd., 329, High Holborn, W.C.1.—Particulars and samples of "Frigidens" refrigerator gaskets.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A new and complete catalogue of electric light fittings and accessories.

Hoffmann Manufacturing Co., Ltd., Chelmsford.—A leaflet dealing with needle roller bearings.

National Gas & Oil Engine Co., Ltd., Ashton-under-Lyne.—A leaflet describing the company's heavy oil engines.

A.E.G. Electric Co., Ltd., 131, Victoria Street, S.W.1.—A booklet on tariff meters.

Gent & Co., Ltd., Faraday Works, Leicester.—A catalogue of bells, indicators, pushes, relays, audible and visible signalling systems.

Marryat & Scott, Ltd., 75, Clerkenwell Road, E.C.1.—A brochure on the Scott-Winslade patent door engines.

British Insulated Cables, Ltd., Prescot.—A leaflet on electrolytic condensers.

Ferranti, Ltd., Hollinwood.—New lists on 2½-in. dial instruments and test sets and a.c. reverse relays types "R" and "RO."

Bankruptcy Proceedings

Lilian Haigh, trading as S. Haigh & Co., 288, Keighley Road, Frizinghall, Bradford, wireless and electrical dealer.—At the first meeting of creditors held recently at the Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford, it was stated that the failure was due to destruction of stock and trade effects by fire and insufficient turnover to meet expenses. The ranking liabilities amounted to £163 and the net assets to £59, leaving a deficiency of £104. The matter was left in the hands of the Official Receiver.

F. M. Crane, trading as C. S. Mayfield & Co., 67, Carshalton Road, Carshalton, Surrey, and as the Sutton Electrical Installation Co., 38, Brighton Road, Sutton, electrician.—This debtor's application for discharge was heard at the County Court, Croydon, recently. It was stated that he filed his own petition in 1930. The proofs admitted and probable claims amounted to £426, whilst the assets had realised £93. He attributed his failure to depression in trade and heavy overhead charges. The discharge was granted subject to nine months' suspension.

C. Mollanby, radio engineer, Penlan Street, Pwllheli.—First and final dividend of 6s. 3d. in the £, payable May 8th at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.

H. H. Baron, electrician, 84, Duckworth Street, Darwen.—First meeting May 3rd at the Official Receiver's office, District Bank Chambers, Blackburn. Public examination June 5th at the County Court House, Blackburn.

A. D. M. Mayer, electrical engineer and wireless specialist, 75, Pasture Road, Goole.—Trustee, Mr. F. E. Bendall, 27, York Street, Sheffield, appointed April 18th.

G. F. Richards, wireless and electrical dealer, 1, Peel Street, Kidderminster.—Trustee, Mr. A. M. Fairbairn, 1, Priory Street, Dudley, Official Receiver, released March 29th.

H. N. Wicks (Harold Wicks & Co.), electrical specialist, Railway Hotel Buildings, Greenhithe, and at 8, Stone Street, Gravesend.—Trustee, Mr. F. H. Langmaid, 280a, High Street, Rochester, Official Receiver, released March 28th.

C. G. Smith, electrical contractor, 66, Lichfield Street, Wolverhampton.—Trustee, Mr. A. E. Lacon, 34, Waterloo Road, Wolverhampton, released March 26th.

S. M. Shackleton, wireless engineer, 14, Colliergate, York.—Trustee, Mr. W. A. Kay, 17, High Ousegate, York, Official Receiver, released April 8th.

H. Gallie, wireless accessory dealer, Tidworth Market, Tidworth.—First and final dividend of 5s. 8¾d. in the £, payable May 1st at 12, Rolleston Street, Salisbury.

Company Liquidations

G. H. Stevens & Co., Ltd., 4, Bow Lane, London, E.C., electrical engineers and contractors and wireless dealers.—The statutory meeting of creditors of the above was held recently at the offices of Messrs. Porritt, Rainey & Co., 94, London Wall, London, E.C., when it was stated that the shareholders had passed a resolution nominating Mr. A. G. A. Rainey as liquidator of the company. A statement of affairs was submitted which showed liabilities of £1,288, all due to unsecured creditors. The net assets were £346, with a deficiency, so far as the creditors were concerned, of £942. The issued capital was £1,350, and, as regarded the shareholders, there was a deficiency of £2,292. The company was incorporated on May 11th, 1925, to carry on business as electrical engineers and contractors and wireless dealers. The nominal capital was £600, which was subsequently increased to £1,600, of which £1,350 had been paid up. From April 1st, 1930, to April 20th, 1935, the total sales were £10,583, and there was a net loss of £1,215. The directors' remuneration for the same period was £2,055. A resolution was passed appointing Mr. W. A. J. Osborne, of Balfour House, Finsbury Pavement, E.C., as liquidator of the company, with a committee of inspection consisting of the representatives of the A. B. Electric Co., Ltd., Benjamin Electric, Ltd., and the Wholesale Fittings Co., Ltd.

R. J. Morton, Ltd., radio manufacturing engineers, 1-3, Vicarage Road, Hampton Wick, Kingston-on-Thames.—The statutory meeting of creditors was held on April 24th at the offices of Messrs. W. E. Thorpe & Co., 5, John Street, Bedford Row, W.C., when a statement of affairs was submitted which showed liabilities of £398, of which £335 was due to the trade and £34 to Mr. R. J. Morton, a director of the company, in respect of a loan. The assets were insufficient to cover the preferential rent and salaries and there was a deficiency, so far as the latter were concerned, of £28. A resolution was passed in favour of the appointment of Mr. S. Smith as liquidator.

The British Industries Fair

In the course of its annual report for 1934 the Electrical Exhibitors' Committee of the Birmingham Section of the Fair says it feels that many more engineers and buyers from overseas will visit this country in May than in February.

During the year the Committee made representations and suggestions to the Fair Management in regard to a variety of subjects including the attracting of more buyers from overseas, charges for lighting, telephone charges, electrical exhibits in London, catering accommodation for exhibitors and staffs, foreign exhibits, the concentration of electrical exhibits for the greater convenience of visiting buyers, guildroom extensions, the necessity of greater electrical representation, uniform colour schemes and open stands for better display, and to other subjects calculated to make the Fair convenient and attractive to buyers and productive of really beneficial results for exhibitors. Twenty-four electrical associations totalling about 1,600 visitors, officially visited the 1934 Fair. The Committee again desires to draw the attention of exhibitors to the existence of a special department for the securing of accommodation for visitors to Birmingham during the Fair. Inquiries should be addressed to Accommodation Department, British Industries Fair, 95, New Street, Birmingham.

The Electrical Advisory Committee has arranged for official visits to be paid to the Birmingham Section of the Fair by the following Associations connected with the electrical industry:—

Tuesday, May 21st.—Luncheon.
- Institution of Electrical Engineers (Council).
- Incorporated Municipal Electrical Association (Council).
- British Electrical Development Association, Inc. (Council).
- Incorporated Association of Electric Power Companies.
- Provincial Electric Supply Association.
- London Electricity Supply Association.
- British Electrical & Allied Manufacturers' Association (Council).
- Electrical Wholesalers' Federation (Council).
- Electrical Contractors' Association, Inc. (Council).
- Electrical Contractors' Association of Scotland.

Speaker: Mr. E. E. Hoadley, M.I.E.E., president, Incorporated Municipal Electrical Association and president of the forthcoming National Electrical Convention.

Wednesday, May 22nd.—Association of Mining Electrical Engineers (Luncheon).

Thursday, May 23rd.
- Electrical Association for Women (Birmingham and Midlands Branch). (Tea.)

Saturday, May 25th.—Luncheon.
- Electrical Power Engineers' Association.
- Electrical Association for Women (Demonstrators' Circle).
- Students' Section—South Midland Centre, I.E.E. (Tea.)

Tuesday, May 28th.—Luncheon.
- Institution of Electrical Engineers (South Midland Centre).
- Incorporated Municipal Electrical Association (Provincial Centres).
- British Electrical Development Association (Provincial).
- Incorporated Association of Electric Power Companies.
- Association of Supervising Electrical Engineers.
- Illuminating Engineering Society.
- Association of Steel Conduit Manufacturers.
- Association of Consulting Engineers, Inc.
- Electrical Wholesalers Federation (Provincial).
- Electrical Contractors' Association, Inc. (Provincial).
- Municipal Tramways & Transport Association, Inc.
- Tramways, Light Railways & Transport Association.

Speaker: Mr. Herbert G. Williams, M.P., executive director, Incorporated Association of Electric Power Companies.

The Prince of Wales will visit the Fair on Thursday, May 23rd.

Since the last list of exhibitors was published in our issue of April 19th the following further names have been received:—

Aladdin Industries, Ltd.
Avery, W. & T., Ltd.
Babcock & Wilcox Ltd.
B.E.N. Patents, Ltd.
Benham & Sons, Ltd.
Britannia Tube Co., Ltd.
British Electric Transformer Co., Ltd.
British Emulsifiers, Ltd.
British Oxygen Co., Ltd.
Brookes & Adams, Ltd.
Brooks, J. B., & Co., Ltd.
Cable & Wireless, Ltd.
Cellon, Ltd.
Copes Regulators, Ltd.
Crampton Bros., Ltd.
Crossley Bros.
Crosthwaite Engineering & Furnace Co., Ltd.
Enfield Rolling Mills, Ltd.
Eriths Engineering Co., Ltd.
French, W. T., & Son.
Gordon, J., & Co., Ltd.
Greenwood & Batley, Ltd.
Groves, S., & Co., Ltd.
Guiterman, S., & Co., Ltd.
Harper, J., & Co., Ltd.
Herbert, A., Ltd.
Hope's Heating & Lighting, Ltd.
Howden, J., & Co., Ltd.
Insulations, Ltd.
International Combustion, Ltd.
Johnson, Matthey, & Co., Ltd.
Johnson, Richard, & Nephew, Ltd.
Lathe, C., & Co., Ltd.
McDowell, Steven, & Co., Ltd.
Midland Fan Co., Ltd.
Mirrlees, Bickerton & Day, Ltd.
Mirrlees Watson Co., Ltd.
Pickerill, J., & Son.
Pilkington Bros., Ltd.
Pinchin Johnson & Co., Ltd.
Ransomes & Rapier, Ltd.
Rawplug Co., Ltd.
Ruston & Hornsby, Ltd.
Sankey, J., & Sons, Ltd.
Stirling Boiler Co., Ltd.
Stokes Appliances, Ltd.
Tangyes, Ltd.
Thomas, Bertram.
Tube Products, Ltd.
Tubes, Ltd.

Electricity Supply

Lighting, Domestic, Power

Accrington.—Mains.—The Electricity Committee is to extend mains at Clayton-le-Moors at a cost of £400.

Allendale (Northumberland).—Electricity Scheme.—Electric lighting has been brought into use for the inhabitants, and a street-lighting scheme is now being proceeded with.

Argentina.—Supply Progress.—Steady progress continues to be made by electricity supply undertakings in Argentina, evidence of which is afforded by the recently issued reports for 1934 of a number of undertakings in that country. The Compania Hispano-Americana de Electricidad, Buenos Aires, for instance, last year sold no less than 864,964,000 kWh as compared with 794,059,000 kWh in 1933. During the year the number of customers supplied by the Hispano-Americana undertaking increased from 384,780 to 400,006. The sales of the Société d'Electricité de Rosario were 103,786,500 kWh last year, as compared with 96,299,500 kWh in 1933, the number of consumers increasing from 58,805 to 60,807.

The floodlighted tower of the Dutch pavilion at the Brussels Exhibition which is now in progress and continues until November

Banks. — Supply Plans.—The Lancashire Electric Power Co. intends to launch a scheme to provide the village with electricity if there is sufficient demand.

Bedford.—Extensions.—Mains extensions are to be carried out to supply electricity to houses in London Road (sixty-four), Cardington Road (fifty-four), Honey Hill Road (fourteen), and Cranfield Court Estate (fourteen).

Reduced Charges for Small Houses.—Following complaints about the increased charges introduced in the rural area last September, the Town Council is to discontinue the minimum assessment on houses with a rateable value up to £10 at present in force in Zone II (excluding Kempston urban district) and Zone III, and is to introduce a graduated scale for premises with net rateable values between £2 and £10. The minimum quarterly charges are also to be reduced.

Bexhill.—Change-over.—The Electricity Committee has obtained sanction to borrow £7,656 in connection with the change-over.

Brighton.—Sub-station Improvements.—Extensions are proposed at the Church Street sub-station at a cost of £1,335 and Warren Farm sub-station (£935).

Floodlighting.—The Parks Committee has asked the Electricity Committee to arrange for the floodlighting of public gardens and flower beds surrounding the fountain in the Old Steine.

Improving the Supply System.—Various improvements to the supply system are to be carried out by the Electricity Committee, at a cost of £8,551, to make possible the automatic discriminative isolation of any section of the system.

Chelmsford.—Street-lighting Scheme.—The Lighting Committee has asked the gas engineer to prepare a scheme for lighting the whole town by electricity, and the borough treasurer is to report as to the effect which this may have upon the price of gas and as to the present position of the loans for public lighting. The gas undertaking in the town is owned by the Corporation, and the electricity undertaking is managed by the County of London Electric Supply Co., Ltd.

Chester.—Decorations.—The special Historical Attractions Committee proposes to spend £3,382 on a scheme of floodlighting and decorations during the summer months as suggested by the city electrical engineer.

Sub-station.—The Electricity Committee has acquired a site at Lower Kinnerton for the erection of a sub-station.

Coventry.—Sub-station Plant.—An expenditure of £12,600 on sub-station plant has been recommended by the Electricity Committee.

Croydon.—Boiler Plant.—The Electricity Committee has obtained sanction to borrow £5,500 for boiler-plant alterations.

Darlington.—Loan.—The Corporation has decided to apply for sanction to borrow £10,000 for transformers and switchgear.

Durham.—Electricity in Schools.—The County Education Committee has under consideration recommendations from the various district sub-committees for the installation of electric lighting at the Blaydon East intermediate school, Marley Hill school, and the Stalwell school.

Eccles.—Sub-station.—A sub-station is to be erected in the Cromwell Road area at a cost of £1,340.

Fringe Order.—The Electricity Committee is to apply for a Fringe Order to supply the Barton Moss district.

Exeter.—Lower Charges.—The Electricity Committee has reduced the kW charge from £3 15s. to £3 10s. per quarter and the "unit" charge from ¾d. to ½d.

Grimsby.—Supply Extension.—A supply is to be given by the Electricity Committee to the oil-refinery works of Messrs. Herbert Green & Co., Ltd., at North Killingholme, at a cost of £29,500.

Keighley.—Loans.—Application is being made by the Electricity Committee for sanction to loans of £6,000 for sub-stations and equipment, and £5,000 for prospective expenditure on consumers' appliances during the next three years.

London.—Battersea.—An expenditure of £10,843 is recommended by the Electricity Committee on the extension of feeders to deal with the increasing load in the Albert Bridge Road and Battersea Park areas at a cost of £10,843. The Committee also intends to provide services to 120 premises at a cost of £919.

Bermondsey.—Sanction has been obtained by the Electricity Committee to borrow £14,000 for mains and services, £6,000 for meters and £10,000 for wiring installations.

Poplar.—The Electricity Committee reports that it is now necessary to make provision for additional mains to supply the L.C.C. flats at Bromley. These dwellings will be all-electric and equipped with electric cookers, fires and irons. On account of the success of the cooker scheme mains elsewhere need to be strengthened, and the Committee proposes to provide new mains at a cost of £9,500, buildings (£1,000) and switchgear and machinery (£1,600).

It is proposed to equip the London County Council's flats at Ranwell Street and Oban Street with electric cookers, fires and irons.

Marsh Gibbon.—Electricity Available.—A supply of electricity was inaugurated recently in the district.

Maulden (Beds).—Street Lighting.—Further consideration is being given to the question of having street lighting installed.

Merthyr Tydfil.—School Lighting.—The Merthyr Electric Traction & Lighting Co. is to charge 6d. per kWh for all electricity consumed for lighting purposes in the schools.

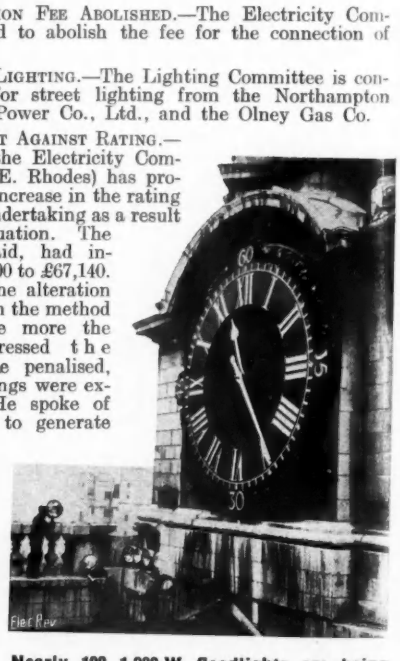
Morecambe.—Sub-stations.—The Electricity Committee proposes to erect a sub-station in Oxcliffe Road and to enlarge the Dalton Road sub-station.

New Plant.—Tenders are being obtained by the Electricity Committee for the supply of two switchboards and a 400-kVA transformer.

Meter Connection Fee Abolished.—The Electricity Committee has decided to abolish the fee for the connection of meters.

Olney.—Street Lighting.—The Lighting Committee is considering tenders for street lighting from the Northampton Electric Light & Power Co., Ltd., and the Olney Gas Co.

Preston.—Protest Against Rating.—The chairman of the Electricity Committee (Coun. H. E. Rhodes) has protested against the increase in the rating of the electricity undertaking as a result of a recent revaluation. The assessment, he said, had increased from £37,300 to £67,140. He added that some alteration ought to be made in the method of rating, for the more the undertaking progressed the more would it be penalised, whether the buildings were extended or not. He spoke of firms threatening to generate their own electricity unless improved terms were given, and said that if the undertaking were derated, as in the case of the privately owned generating stations of business firms, it would have between £14,000 and £15,000 with which to meet these demands.



Nearly 100 1,000-W floodlights are being used to illuminate St. Paul's Cathedral during the Jubilee celebrations. Our illustration shows some of the Siemens floodlights being fixed to the roof

Russia.—Electricity Output.—According to the *Moscow News*, the output of the Russian generating stations during the first quarter of the current year amounted to 4,120 million kWh, an increase of 27.8 per cent. over the corresponding period of 1934.

NEW POWER STATIONS.—Two hydro-electric stations of 1,200-h.p. capacity each are to start operation this year in Megri and Shaki in the Sisien district of Transcaucasia. Both have been equipped with turbines, generators, transformers, &c., by Moscow and Leningrad industrial works.

Rawtenstall.—LOAN.—The Electricity Committee has obtained sanction to borrow £10,000 for electricity services.

Salford.—SUB-STATION.—The Electricity Committee has recommended application for sanction to a loan of £10,000 for unspecified sub-stations and equipment.

Sheffield.—ASSISTED-WIRING SCHEME.—Tenants of 596 houses on the Wybourn estate have applied for electrical installations under the assisted-wiring scheme, and mains extensions are to be proceeded with at an estimated cost of £9,319.

Southend-on-Sea.—DOMESTIC EQUIPMENT.—The borough electrical engineer has been authorised to obtain tenders for the replacement of electrical equipment in 364 houses on the Sutton Road estate.

Sunderland.—AN UP-TO-DATE SCHOOL.—A new Council school which is being built on the Ford estate is to employ electrical means for drying scholars' clothes and boots, and, instead of sharing towels, the children will use an electric hand dryer.

ELECTRICAL TIME-KEEPING.—A master electric clock is being installed at the Corporation generating station and synchronised timepieces, each bearing an electricity slogan, are to be provided at twelve principal points along the tram and bus routes.

Sutton Coldfield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £2,000 to provide a supply to new estates.

Tredegar (Mon).—LOAN.—With the completion of the first part of the new electricity scheme for the district the Council has decided to apply for sanction to borrow £5,610 towards the cost of carrying out the second section of the work.

Tunbridge Wells.—A LARGE ELECTRIC-DISCHARGE LIGHTING INSTALLATION.—An extensive installation of G.E.C "Osira" street lighting has been carried out at Tunbridge Wells, and another is now being put into operation. The initial installation was carried out in St. John's Row, London Road, and Eridge Road, where eighty-two 250-W units are housed in lanterns designed specially by the Electricity Department under the supervision of Mr. R. N. Torpy, the borough electrical engineer. The units are mounted at 25 ft. from the roadway on 6-ft. projection brackets extending towards the centre of the thoroughfare. Extensions involving the use of a further 132 units have been prepared. Our illustration shows how clearly the road signs can be read at night by electric-discharge lighting.

Ukraine.—A LARGE TURBINE.—The construction of a 100,000-kW turbine has been commenced at the Kharkor electrical equipment plant for the Stalingorsk power station.

Wall (Staffs).—STREET LIGHTING.—The electrical engineer is to be asked for an estimate of the cost of lighting the streets and also of extending the mains along Watling Street to Muckley Corner.

Motorists will appreciate the new "Osira" lighting at Tunbridge Wells, part of which is shown above

Watford.—EXTENSIONS.—Considerable extensions are to be made to the generating plant at the power station at a cost of £83,000. The machinery includes one 15,000-kW turbo-

Jubilee Illumination Notes

FOR several weeks past we have published details of schemes for celebrating the Royal Jubilee, in the course of which the special arrangements at more than 150 towns and villages have been briefly reviewed. The following is a final list of illumination programmes and reduced tariffs.

Among the buildings in London which are to be floodlighted are the Old Bailey, the Guildhall, Mansion House, Ludgate Hill Railway Bridge, St. Paul's Station, Tower Bridge, the Monument, St. Dunstan's, St. Mary's Church, St. Bride's Church, and St. Mary-le-Bow. All these are in the area of the Corporation of the City of London, and the work is being done by Siemens Electric Lamps & Supplies, Ltd.

At Bridgwater St. Mary's Church will be floodlighted by the Bridgwater & District Electric Supply & Traction Co., Ltd., and at Bristol seven important buildings are to be illuminated and the Clifton suspension bridge outlined. Deptford Council is to floodlight the Town Hall, while the Abbey Church is to be floodlighted at Waltham.

Other notable examples of floodlighting will be seen at the Leeds Civic Hall and Town Hall, the parish church at Skipton, Crowland Abbey, Durham Cathedral, the ruins of Verulamium at St. Albans, York Minster, and the Council offices, Egham. The Rayleigh Urban District Council is considering the floodlighting of the parish church and the British Legion hall.

Messrs. Holophane, Ltd., have sent us a list of floodlighting installations which they have prepared throughout the country for the Jubilee celebrations. In London, the Battersea power station, Central Hall, Westminster, and Westminster Abbey are included. The latter is one of many where Crompton high-wattage lamps and "Derite" sheathed cables are being used; 11,000 yd. of cable was needed for Westminster Abbey. Holophane provincial installations are Lincoln and Carlisle Cathedrals and Whitby and St. Albans Abbeys.

Castles to be floodlighted include Norwich, Shrewsbury, Newark, Bolsover, Haverfordwest, Newcastle, Castletown (I.O.M.), Skipton, Tynemouth and Durham. It is proposed to floodlight the college at Sawston, the Sir Isaac Newton statue at St. Peter's Hill, Grantham, Helmsley town hall, St. Michael's-at-the-North Gate Church, Oxford, Yeovil parish church, and the civic centre at Southampton.

At Norwich the principal floodlighting arrangements include the Guildhall, the Tombland side of the two waterways leading to the Close, and the water tower at Mousehold. Several public buildings, Town Hall Square and the Victoria Park are to be illuminated and floodlighted at Keighley, while the Tynemouth borough electrical engineer has been authorised to arrange for the floodlighting of the town hall and Christ Church.

Mr. W. E. Jones, the borough electrical engineer of Basingstoke, informs us that the clock tower of the town hall is to be floodlighted with 1,000-W projectors. The front of the town hall is to be outlined in coloured lamps with flashing sign and special patriotic illuminated devices. The municipal offices are to be floodlighted with special projectors using colour screens and the entrance gates and bandstand of Memorial Park are to be festooned with coloured strip lighting.

At Bingley over three thousand fairy lamps are being used. An illuminated tram is being run at Birmingham. Hoylake Council is supplying electricity for decorations free of charge next week and on Wednesday and Thursday illuminated boats are to sail on the Marine Lake.

To encourage the use of electricity during the celebrations specials tariffs have been adopted by many undertakings. Some, such as Huddersfield, Sevenoaks and the South London Electric Supply Co., are supplying electricity for floodlighting buildings free of charge, although the last-mentioned company is charging ½d. per kWh to private consumers. We understand from Mr. J. Leadbeater, the electrical engineer and manager, that Hampstead Council has agreed to reduce the charge for electricity used on temporary circuits for floodlighting and decorative lighting during May to ½d. per kWh, plus a fixed charge of 10s. to cover connection and disconnection and the loan of an additional meter when required.

Peterborough Corporation has reduced the price of electricity for Jubilee displays to 1d. per kWh, while competitions are being held for decorated house, shop exteriors and shop windows.

Watford Electricity Department is to supply electricity for illumination purposes at ½d. per kWh from May 4th to 11th. Tynemouth Electricity Department is charging 1d. per kWh for all electricity consumed in excess of the figure for the corresponding quarter of last year. Time switches will be provided if required.

The Birkenhead Electricity Committee is offering a special rate of ½d. per kWh with a minimum charge of £1, supplies being metered separately. The same charge will be made at Crewe. At Stone (Staffs) ¾d. will be charged and 2d. at Witney (Oxon). It is announced by Mr. F. Nicholls, the Derby borough electrical engineer, that the terms for supply of electricity to consumers desiring to show special illuminations will be: (1) A charge of 10s. to cover the cost of a temporary connection, and disconnection. (2) A charge of ½d. per kWh for electricity consumed (minimum 5s.). (3) Consumers to provide all lighting devices, together with the wiring thereto.

One of the busiest departments of the B.B.C. during Jubilee week will be that responsible for relaying national Jubilee events. To ensure that apparatus will be available whenever needed, a schedule is being prepared that will allow equipment to be moved about London and installed in adequate time. For Jubilee week alone the Outside Broadcast Department in London will employ eighty-four microphones and eighteen microphone control units which are used to "fade" from the sounds of one point to another. Additional equipment includes thirty amplifiers, sixty switching sets, 5,208 yd. of cable with a thousand terminal connections. About 120 h.t. and 70 l.t. batteries will be connected for outside events.

alternator set, with auxiliaries, one 80,000-lb.-per-hour water-tube boiler, with auxiliaries; switchgear and cables; coal elevator and conveyor; and new circulating water culvert.

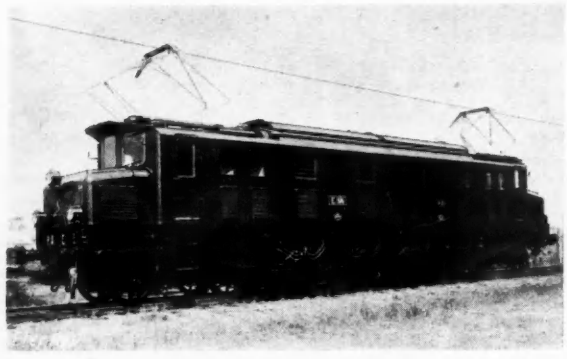
Whitley Bay.—ILLUMINATIONS.—The Whitley and Monkseaton Urban District Council is to be supported by the hotels at Whitley Bay in a scheme for illuminating the Promenade.

Wimbledon.—EXTENSIONS.—The Corporation has decided to extend the electricity supply system at New Malden by the erection of additional plant and the linking up of the district with the grid. Messrs. Merz & McLellan have been recommended by the Electricity Committee as consulting engineers in connection with the scheme.

Traction

Austria.—TAUERN LINE COMPLETED.—The conversion of the south bank of the Tauern line from Mallnitz to Spittal-Millstattersee has been finished and the line will be opened to electric traction on May 15th. The north bank was electrified in December, 1933, and the whole section forms a southern off-shoot of the 15-kV, 16.6-cycle, single-phase main line of the Austrian Federal Railways from Innsbruck to Salzburg.

France.—IMPORTANT EXTENSION.—With the beginning of the summer time-tables on May 15th the 186-mile heavily graded Vierzon to Brive section of the Paris Orléans Railway's line from Paris to Toulouse will be converted to electric operation on the 1,500-V d.c. system. The 142 miles from Paris to Vierzon have been electrified since 1926, and the conversion of the Vierzon to Brive division has been carried out during



One of the locomotives used on the electrified section of the Paris to Toulouse line

the last four years. The annual consumption will be about 60,000,000 kWh, and power is being obtained from the hydro-electric stations in the Dordogne through 220-kV and 90-kV systems, and will be delivered to the overhead contact line through twelve remotely controlled rotary convertor sub-stations.

Huddersfield.—TROLLEY-BUSES INSTEAD OF TRAMS.—The Tramways Sub-Committee has recommended the Town Council to substitute trolley-buses for trams on all routes inside and outside the borough.

Ipswich.—INQUIRY.—An inquiry was held recently into the Corporation's application to operate additional trolley-bus services. The application was opposed by the Suffolk County Council, local Rural District Councils and others.

Manchester.—TROLLEY-BUSES.—The Transport Committee has decided to ask for powers to run trolley-buses. On many routes motor buses are being used to replace trams, which are being put out at the rate of two a week.

Yugoslavia.—A NEW UNDERGROUND RAILWAY.—The Yugoslavian Department of Communications has prepared a scheme for the construction of an underground railway in Belgrade. The line will connect the Sava harbour with the Danube harbour, and it will be 1.55 miles long.

Communications

Australia.—TELEPHONE PROGRESS.—A contract for the building of a new automatic telephone exchange at Melbourne has been placed at a cost of between £75,000 and £80,000. The conversion of the Central Exchange to automatic working, as mentioned last week, is expected to be completed in two and a half years at a cost of £300,000, but it is being opened in units, the first of which (between 600 and 800 lines) is nearly ready. Figures issued by the Postmaster-General's Department show that the telephone system of the Commonwealth comprises more than 6,000 exchanges to which about 520,000 instruments are connected. Close upon £43,000,000 of public money is invested in apparatus.

NEW BROADCASTING STATIONS.—Tenders for the supply of five new Regional broadcasting stations, each costing between £150,000 and £200,000, are to be called for by the Australian Government, states the *Wireless World*. They will be supplementary to seven other Regional stations now in course of construction.

Canada.—TELEVISION.—A *Reuter* message from Montreal (Quebec) states that Canada now has its first television broadcasting studio, but for the time being it will be used for demonstration purposes rather than for regular broadcasting as there are only two television receiving sets in Montreal.

Folkestone.—A TELEPHONE EXPERIMENT.—This week an experiment was carried out in the automatic exchange area with a system by which, when a subscriber rings an engaged number, a voice recorded on a sound film, which is switched on automatically, announces "Engaged," instead of the usual buzzing sound being heard.

France.—TELEVISION.—The first public demonstration of television in France took place last Friday, and was stated by *Reuter* to have been successful.

PARIS TELEPHONES.—A further message from Paris states that two more telephonic districts have gone over to the automatic system. Of the total of 209,000 telephone subscribers in the metropolis 199,000 (95 per cent.) are now connected to automatic exchanges. It still remains to transform the central exchange, which serves the City area.

PICTURE TELEGRAPH SERVICES.—Picture telegraphic transmission services have lately been established between Paris and Vienna and between Paris and Cologne.

Great Britain.—BETTER TELEPHONE AND TELEGRAPH FACILITIES.—The Postmaster-General (Sir Kingsley Wood) has announced new telegraph charges to come into operation on May 31st. Ordinary telegrams will cost 6d. for nine words, and a 1d. per word thereafter, but priority will be given to those for which an extra 6d. "express" fee is paid. There will be extended night telegraph letter facilities and concessions to users of "batch telegrams." Half-rate calls to the Empire from May 6th to 31st and cheaper calls to Northern Ireland and the Isle of Man are promised, and every village on the mainland of Great Britain and Northern Ireland which has a post office is to be equipped with a public call office by the end of next year.

BROADCASTING POLICY.—The first meeting of the Committee appointed by the Postmaster-General to advise as to future policy in regard to the broadcasting service took place at the General Post Office on Wednesday, under the chairmanship of Lord Ullswater.

Italy.—RADIO LICENCES.—There are now 430,000 registered listeners in Italy.

Poland.—A HIGH-POWER RADIO STATION.—According to the *Wireless World*, Poland intends to celebrate its tenth anniversary of broadcasting in July next by the installation of a new 200-kW transmitter at Raszyn (Warsaw) and a second regional transmitter working on 20 kW. It is also stated that Polskie Radio, which is partly State controlled, is considering the development of short-wave broadcasting for the benefit of nationals overseas. If, however, funds do not permit of the construction of a new station Germany may be asked to relay Polish programmes through Zeesen. There are now 420,000 listeners in the country.

TELEGRAPHY.—Direct radio-telegraphic communication has recently been established between Warsaw and Rio de Janeiro (Brazil) and between Warsaw and Buenos Aires (Argentina).

Sweden.—TELEPHONE AND TELEGRAPH REPORT.—The annual report of the Telegraph and Telephone Department for 1934 shows a surplus profit of 34.12 million kronor (£1,878,855 at par), which is equivalent to 9.6 per cent. on the State capital invested during the year. The 1934 figure surpasses the 1933 profit by over 4 million kronor (£220,264 at par). The total revenues of the Department were 107.98 millions (£5,946,035 at par) and the expenditure 73.86 million kronor (£4,067,181 at par).

United States.—A ROUND-THE-WORLD TELEPHONE CALL.—An experimental round-the-world telephone call was made from New York last week. The call was transmitted to London by transatlantic telephone, to Amsterdam by cable, and by radio to Java, San Francisco, and so back to New York.

An Australian Hydro-electric Development

One of the responsibilities of the Victoria Electricity Commission is the investigation and recording of the State's potential power resources, folowed by estimation of the economic possibilities for their development. Officers of the Commission have been engaged for some years in making a detailed investigation of the hydro-electric power potentialities of the alpine region of north-eastern Victoria, determining suitable sites for power stations. Attention has been concentrated on the headwaters of the Kiewa river, and as the result of investigations a tentative scheme of headworks and power stations has been drawn up so that development can be proceeded with in the future. No indication can as yet be given of a probable date of development, for this is entirely dependent upon the increase of power demand in the State and the result of economic comparison of the scheme with other possible means for power supply, states the Australian *Electrical Engineer and Merchandiser*.

Thorough investigation has led to the conclusion that the installed capacity of this scheme (exclusive of spare plant) should be 94,800 kW, having a reliable peak load capacity at all times of about 91,000 kW. The plant would be installed in four power stations with capacities of 21,000 kW, 28,000 kW, 43,200 kW, and 2,600 kW respectively. The average annual output of energy from the scheme would amount to approximately 450,000,000 kWh.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—ADELAIDE.—May 30th. South Australian Water Supply Department. Water turbines and electric generating and operating machinery for Mount Bold reservoir dam. (A.Y. 13019.)*

Belfast.—May 17th. Electricity Department. Steel steam receiver, water piping and valves, h.p. switchgear and reactors, l.p. a.c. switchgear, and economisers. (See this issue.)

Birmingham.—May 10th. Electric Supply Department. Cable-jointing compounds. (April 19th.)

Bradford.—May 16th. One 500 kW mercury-arc rectifier equipment. (April 19th.)

Cheadle & Gatley.—May 10th. Electricity Department. One 250-kVA transformer switch and distribution kiosk sub-station. (April 26th.)

Chesterfield.—May 13th. Electricity Department. Transformer kiosks and material and apparatus for conversion of appliances from d.c. to a.c. (April 26th.)

Dartford.—May 9th. Town Council. Electric wiring installation at 160 houses on the Heath Lane estate. Particulars from the town clerk.

Eastbourne.—May 3rd. Electricity Department. Tower wagon electric vehicle. (April 26th.)

East Retford.—May 20th. Electricity Department. 11,000-V and 400/230-V overhead distribution lines and transformers. (See this issue.)

Egypt.—CAIRO.—May 30th. Ministry of the Interior. Single and three-phase electricity meters. (A.Y. 13045.)*

Ellesmere Port.—May 13th. U.D.C. Electric wiring, &c., of 116 houses on the Grange Farm estate. Specifications, &c., from the Council Offices (deposit £1 1s.); tenders to the clerk of the Council.

Exeter.—May 8th. Electricity Department. Electric cookers and water heaters. (April 12th.) Transformers. (April 26th.) May 16th. Electricity Department. 6,600-V switchgear. (See this issue.)

Glasgow.—May 13th. Electricity Department. Cables, flexibles, meters and cable covering tiles for the year ending May 31st, 1936. (April 26th.)
May 14th. Corporation. Electrical work at alterations and additions at Stobhill General Hospital. Specifications and forms from Office of Public Works, City Chambers (Room 81), (deposit £2 2s.); tenders to town clerk.

Halifax.—May 18th. Watch Committee. Various works, including electrical, at the police station, Ovenden. Specifications, &c., from D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.); tenders to the town clerk.

Hastings.—May 9th. Porcelain insulators and metering equipment. (April 19th.)

Huyton-with-Roby.—May 6th. U.D.C. Vertical spindle electric motor-driven sewage pumping plant and automatically driven screening plant. Specifications, &c., from H. B. Ward, consulting engineer to the Council, 26, North John Street, Liverpool (deposit £5 5s.); tenders to be sent to the clerk of the Council.

India.—June 4th. India Store Department. Hydro-electric generating sets and step-up transformers for the Mettur hydro-electric scheme. (April 19th.)
South Indian Railway Co., Ltd. May 10th. 11,000-V outdoor sub-station, switchgear and accessories. (April 26th.)
SIMLA.—May 25th. Indian Stores Department. A.c. equipment for testing train lighting dynamos. (A.Y. 13034.)* Alternators, transformers, converting equipment and switchgear for a central power station at Peshawar Cantonment. (A.Y. 13033.)*

Irish Free State.—DUBLIN.—May 7th. Commissioners of Public Works. Electric lighting installation at Island Bridge barracks. Particulars from T. Cassedy, secretary, Office of Public Works.

Isle of Ely.—May 7th. County Council. Vehicle-actuated traffic signals at a four-way junction. Particulars from the County surveyor.

Kingston-on-Thames.—May 11th. Corporation. Street lighting equipment. (April 26th.)

Lanarkshire.—May 8th. Mental Hospital Joint Committee. Various works, including electrical and steam cooking, heating and hot-water services and laundry machinery, at the Hartwoodhill Mental colony. Schedules from clerks and treasurers, Lanarkshire House, 191, Ingram Street, Glasgow (deposit £5).

London.—STEPNEY.—May 30th. Electricity Supply Undertaking. Meters, demand indicators, conduits, troughs, covers and lamps as required from July 1st, 1935, to June 30th, 1936. (See this issue.)
BETHNAL GREEN.—May 21st. Borough Council. Rising mains at tenement dwellings. (See this issue.)

Manchester.—May 18th. Waterworks Committee. Electrically driven pumps with control gear and rectifier equipment with h.p. and l.p. switchgear. (See this issue.)

Mexborough.—May 15th. Electricity Department. E.h.p. and l.p. p.i. cables for the period ending March 31st, 1936. (See this issue.)

Middlesbrough.—May 13th. Electricity Department. Fifteen-panel metal-clad compound or oil-filled switchboard. (April 19th.)

New Zealand.—WELLINGTON.—June 4th. Post and Telegraph Department. Two- and three-conductor flexible cords. (A.Y. 13031.)*
June 19th. 7,000 sack elements, ammonium chloride and 2,500 zincs for Leclanché cells. (A.Y. 13029.)*
Public Works Department. August 13th. 11,000-V indoor switchgear and control equipment for the Arapuni power development. (A.Y. 13030.)*

Oldham.—May 7th. Electricity Committee. Single-way earthenware conduit. (April 19th.)

Sheffield.—May 15th. West Riding County Council. Electric lighting at the Ecclesfield Burn Cross (Chapeltown) Council school. Specifications, &c., from A. Rayner, 151, Cross Hill, Ecclesfield.

South Africa.—JOHANNESBURG.—June 15th. City Council. Three-phase calibrating convertor. (A.Y. 13025.)*

Southampton.—May 28th. Electricity Department. Piping and plant for connecting up three boilers and two steam turbines, &c. (See this issue.)

Southport.—May 16th. Electricity Department. Switchgear. (See this issue.)

Spenborough.—May 10th. U.D.C. Cable and steel kiosk. (April 19th.)

Stornoway.—May 6th. Town Council. Wiring for electric lighting at housing scheme. Specifications, &c., from borough surveyor; tenders to town clerk.

Stranraer.—May 20th. Town Council. Electrical fittings at 154 houses. Specifications from A. MacLean Goudie, architect, 30, Lochryan Street (deposit £1); tenders to town clerk.

Sunderland.—May 20th. Electricity Department. Thermal storage heating installation at the electricity undertaking's Sales Department. (See this issue.)

Sutton & Cheam.—May 16th. Corporation. Four electrically driven vertical centrifugal pumps with piping, valves, &c. Specifications, &c., from R. H. Mitchell, borough engineer and surveyor (deposit £2); tenders to the town clerk.

Swindon.—May 16th. Electricity Department. L.p. p.i. cables for the period ending March 31st, 1936. (See this issue.)

Tynemouth.—May 6th. Electricity Department. One 625-kVA transformer. (April 26th.)

Walsall.—May 8th. Electric Supply Department. One 70-kW glass-bulb mercury-vapour rectifier. (April 19th.)

Wigan.—May 13th. Electricity Department. E.h.p. and l.p. cables. (April 19th.)

York.—May 7th. Electricity Department. H.p. and l.p. cables. (April 26th.)

---

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Australia.—COMMONWEALTH.—P.M.G.'s Department. Accepted. Loading coil pots (£4,347).—British General Electric Co. Dial parts (£592).—Standard Telephones & Cables (A'sia), Ltd. Indicators.—Standard Telephones & Cables (A'sia), Ltd. (£1,091); Ericsson Telephone Manufacturing Co. (£258). Underground cable.—Metal Manufacturers Pty., Ltd.; British Insulated Cables, Ltd.

Birkenhead.—Electricity Committee. Accepted. Two 500-kW mercury-vapour rectifier equipments (£5,683).—English Electric Co., Ltd.

Brighton.—Electricity Committee. Accepted. Testing apparatus (£138).—T. Glover & Co., Ltd.
General Purposes Committee. Accepted. Electrical installation at Warren Farm schools (£623).—Page & Miles, Ltd. This was chosen from seven tenders, the lowest being £600 and the highest £775.
Waterworks Committee. Accepted. Electric lighting installation at Goldstone pumping station (£163).—Bostel Bros. (Worthing), Ltd.

Burnley.—Electricity Department. Accepted. 12,852 yd. of copper conductors.—Whitecross Co., Ltd.

Croydon.—Cemeteries Committee. Recommended. Electric furnace for Mitcham Road cemetery crematorium (£1,400).—Birmingham Electric Furnaces, Ltd.
Electricity Committee. Recommended. Superheater tubes (£193).—Babcock & Wilcox, Ltd.

Grimsby.—Electricity Committee. Recommended. Secondary air equipment for boiler-house plant (£575).—Riley Stoker Co., Ltd. 22,000-V cable to North Killingholme (£11,600).—British Insulated Cables, Ltd.

Jarrow-on-Tyne.—Town Council. Accepted. Electric lighting in 172 houses at Monkton (£844).—J. McCabe.

Kirkcaldy.—Town Council. Accepted. Electrical work at housing scheme (£337).—J. G. Woodcock.

Liverpool.—Electric Power and Lighting Committee. Recommended. Isolating switches at two sub-stations (£717).—A. Reyrolle & Co., Ltd.

London.—POPLAR.—Electricity Committee. Recommended. Renewal of boiler economiser (£460).—Clarke, Chapman & Co., Ltd.

Manchester.—Electricity Committee. Accepted. At Stuart Street power station: Low-pressure pipework, &c.—Brightside Foundry & Engineering Co., Ltd. Sub-contractors: Exhaust pipes.—W. G. Allen & Co., Ltd. Tubes.—Stewarts & Lloyds, Ltd. High-pressure pipework, &c.—Stewarts & Lloyds, Ltd. High-pressure valves.—Hopkinsons, Ltd.; A. Turnbull & Co., Ltd. Neutral earthing switchgear and resistors at Benchill and

Failsworth sub-stations.—Ferguson, Pailin, Ltd. Sub-contractors: Ammeters.—Metropolitan-Vickers Electrical Co., Ltd. Earthing resistance.—Rheostatic Co., Ltd.

Town Hall Committee. Accepted. At Town Hall extensions: Electrical installation.—A. E. Sudlow & Co., Ltd. Lifts.—Waygood Otis, Ltd.; John Shaw & Sons (Salford), Ltd.; Etchells, Congden & Muir, Ltd.

Middlesex.—County Council. Accepted. Electric lighting at North Middlesex County Hospital, Edmonton (£815).—Speedy & Eynon, Ltd. This was chosen from six tenders, the lowest being £814 and the highest £971.

Midlothian.—County Council. Accepted. Electrical fittings in fifty-eight houses at Stoneybank Gardens (£322).—Grant & Reid.

Potters Bar.—U.D.C. Accepted. Wiring of Council houses (£313).—A. E. Rising, Ltd. It is reported that the highest tender was £2,019.

Salford.—Light, Heat and Power Committee. Accepted. 40-kW rectifier equipment for the Royal Technical College (£340).—Hewittic Electric Co., Ltd.

Sheffield.—Electricity Committee. Accepted. D.c. traction switchboard.—Whipp & Bourne, Ltd.

South Shields.—Housing Committee. Accepted. Electrical installation at Council houses at Wenlock Road (£732).—W. A. Nelson.

Southend-on-Sea.—Education Committee. Accepted. Installation of electricity at the Old Victoria Hospital (£500).—W. H. Squire.

Town Council. Accepted. Electrically operated delivery van (£176).—All-Electric Motors, Ltd. Apparatus for illuminating the shrubbery (£2,500) and illuminated arch (£150).—Imperial Lighting Co.

Swansea.—Electricity Committee. Accepted. Neon lighting at Castle Street showrooms (£253).—Ionlite, Ltd.

Watford.—Town Council. Accepted. Switchgear (£35,018).—Metropolitan-Vickers Electrical Co., Ltd.

Weymouth.—Entertainments Committee. Accepted. Installation of illuminations at the esplanade: lamps and flexible steel wire rope.—General Electric Co., Ltd.; fairy strip.—Johnson & Phillips, Ltd. Tubular steel poles.—Revo Electric Co., Ltd.

Forthcoming Events

Institution of Electrical Engineers (*Meter & Instrument Section*).—Friday, May 3rd. Institution, London. 7 p.m. "The History and Development of the Integrating Electricity Meter." Mr. A. E. Moore. Saturday, May 4th. 9.30 a.m. Summer visit to the Queen Mary College and Greenwich. (*North-Eastern Students' Section*).—Friday, May 3rd. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Annual general meeting. (*Hampshire Sub-Centre*).—Wdenesday, May 8th. Municipal College, Portsmouth. 7.30 p.m. "Hydro-electric Development in Great Britain." Messrs. A. S. Valentine and E. M. Bergstrom. (*Scottish Centre*).—Friday, May 10th. School of Economics and Commerce, Dundee. 7.30 p.m. Joint meeting with the Dundee Sub-Centre. Faraday lecture. "Electricity in the Life of To-day." Prof. E. W. Marchant. Saturday, May 11th. 9.15 a.m. Excursion from Dundee to Taymouth Castle Hotel, *via* Dunkeld and Aberfeldy. (*Transmission Section*).—Saturday, May 11th. Summer visit.

Junior Institution of Engineers.—Friday, May 3rd. Hotel Metropole, S.W.1. Annual dinner.

Salford Technical & Engineering Association.—Saturday, May 4th. 3 p.m. Visit to the works of Messrs. Lancashire Dynamo & Crypto, Ltd.

Institute of Metals.—Wednesday, May 8th. Institute, London. "Annual May Lecture." Prof. W. L. Bragg.

Notes

Short-centre Drives

Ropes in vee-grooved pulleys or vee-to-flat pulleys have been in satisfactory use for about forty years, but they have found more scope with the extended use of the electric motor. With the vee-rope drive shown 150 h.p. is transmitted from an electric motor to a pump with a speed ratio of from 975 to 250 r.p.m. Short-centre belt drives require a constant tension and the second illustration indicates a recent application of the Crofts "Constension" drive to an air compressor. The motor overhangs a pivot, and its weight and that of its support maintains the belt tension.

The National Convention Programme

The draft programme of the National Electrical Convention to be held at Bournemouth from June 3rd to 8th inclusive, as outlined on page 104 of our January 18th issue, is amplified in the current I.M.E.A. *Journal*. New items are a parade of electric vehicles on Monday, June 3rd, to be inspected by the president (Mr. E. E. Hoadley), who will afterwards deliver an address at a Rotary Club luncheon in the Pavilion (tickets obtainable in advance). On Tuesday, June 4th, the civic welcome has been advanced to 10.15 a.m. The Electrical Exhibition in the Winter Gardens (the participants in which are listed on page 640), will be officially opened at 12.30 p.m. and ladies are invited to meet Mrs. Hoadley for afternoon tea instead of morning coffee. On Wednesday, June 5th, speakers at the joint morning meeting will include Mr. John C. Dalton, representing supply companies' associations, Mr. H. Marryat, representing the contractors, and Sir Felix Pole (not Lord Hirst), representing manufacturers. The "E.C.A. in Wonderland" is timed for 2.15 p.m. at the Pavilion and there is to be an evening steamer cruise from Bournemouth Pier (tickets 7s. 6d. each). On Thursday, June 6th, the morning paper will be on "Industrial Power Supply" and the afternoon paper on "Domestic Electrical Development." The authors of the latter, Miss C. Haslett (E.A.W.) and Mr. W. N. C. Clinch (I.M.E.A.), have been joined by Messrs. C. Nadaud (power companies), and T. E. Alger (E.C.A.). The price of the evening banquet tickets has been increased to 15s. per head, exclusive of wines, and dancing on the terrace will be restricted to diners only. On Friday, June 7th, an afternoon trip is being arranged and there will be dances and carbaret performances at the Burlington and Royal Exeter Hotel, the headquarters.

A Northern Ireland Change-over

We are informed that the inscription under the picture which appeared under the above heading in our last issue is misleading. The left-hand picture shows a part of the old and new l.p. distribution lines at Tandragee, Co. Armagh (not Newcastle as stated). The right-hand picture is of a part of the Newcastle, Co. Down, l.p. network and shows the transition stage between the old and the new line immediately preceding the dismantling of the old (lower) pole and conductors.

The E.A.W. Premises Extended

The increase in area work, in lecturing and in the arrangement of examinations for the E.A.W. electrical housecraft certificate has made it necessary for the Electrical Association for Women to extend yet further the premises into which it moved only two years ago. The offices, clubroom, Housecraft School and cloakrooms now cover more than half of the fifth floor at 20, Regent Street, S.W.1. The new accommodation includes a special room for the London branch formed last autumn, and the inquiry bureau has been moved to a convenient position immediately opposite the lift.

N.E. Coast Institution Jubilee

The North East Coast Institution of Engineers and Shipbuilders will celebrate the attainment of its jubilee by a series of meetings and social events to take place from July 16th to 19th at Newcastle-on-Tyne. Among the papers to be read is one by Mr. M. G. S. Swallow on recent progress in electrical and general engineering.

Appointments Vacant

Examiners in w.t. section of the Air Ministry.

Mains superintendent and male clerk for the Borough of Heston and Isleworth electricity undertaking.

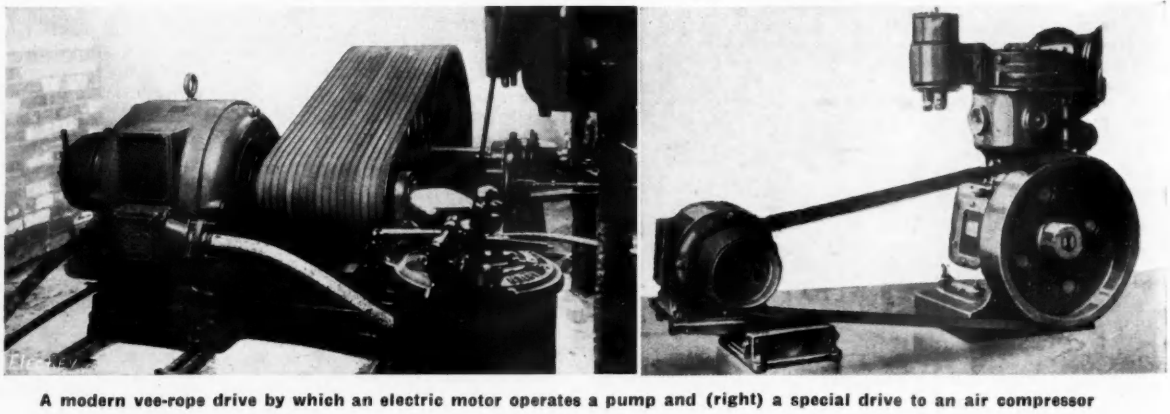
Deputy borough electrical engineer for Rugby Corporation.

Lady showroom demonstrator for Ayrshire Electricity Board.

(See our classified advertisements.)

Makers' Names Wanted

ARATEX cement for paper formers.
REVERSITE circuit-breaker.



A modern vee-rope drive by which an electric motor operates a pump and (right) a special drive to an air compressor

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

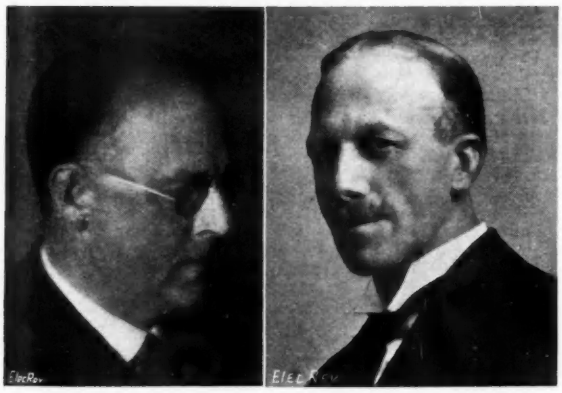
Mr. W. R. Owens, district electrical engineer of the South African Railways at Durban, has been appointed to supervise the electrification of the Rand railway system. Mr. Owens joined the South African Railway service at the conclusion of the electrification of the Glencoe-Maritzburg section, with which he was actively associated in a private capacity. After being promoted to track equipment engineer in 1927, he was transferred to Durban as assistant superintendent (electrical), and was made district engineer in January, 1933.

Mr. A. Bellington Eales, chief engineer of the New Modderfontein Dynamite Factory at Johannesburg, has been appointed chief electrical engineer and tramway manager for De Beers Consolidated Diamond Mines at Kimberley.

In our last issue we reproduced a picture of **Messrs. A. & J. Ellison,** of Messrs. George Ellison, Ltd., with their Leopard-Moth aeroplane, in which they were to take part in an international air rally in Morocco. We are now informed that they won the Coupe Comte de Montigny, and were second in the Fedallah race.

Mr. H. Mowbray-Newton has been appointed assistant development engineer by the Brighton Electricity Committee in succession to Mr. R. D. Goodson.

Mr. C. G. Morley New, city electrical engineer, Cardiff, has been appointed an Electricity Commissioner to fill the vacancy which will occur in July next, on the retirement of **Mr. T. P. Wilmshurst.** Mr. Morley New obtained his early experience at Leeds, and went to Cardiff in 1902, becoming deputy electrical engineer in 1907. He succeeded Mr. Arthur Ellis as city electrical engineer in 1920. His electrical activities, apart from his duties at Cardiff, have been numerous. He has served for several years on the committee of the Western Centre of the I.E.E., of which he was chairman in 1927-28. He was president of the I.M.E.A. in 1932, and in July, 1933, he was appointed a member of the National Consultative Committee of the Central Electricity Board Technical Committees, of which he is deputy chairman. He has also been a member of the Council of the Electrical Research Association, of the E.D.A. Council, and of the I.E.E. Council.



[*Elliott & Fry.*

Mr. T. P. Wilmshurst **Mr. C. G. Morley New**

Mr. Wilmshurst was appointed an Electricity Commissioner in November, 1926. He was formerly electrical and tramways engineer to the Derby Corporation. He was also chairman of the Engineering Consultative Committee of the East Midlands Electricity Advisory Board. He is an M.B.E., and a member of the Institutions of Civil and Electrical Engineers.

Mr. E. Jones, A.M.I.E.E., mains superintendent to the Cardiff Corporation, has been offered the post of city electrical engineer in succession to Mr. C. G. Morley New. The decision to offer the post to Mr. Jones was made at a special meeting of the Cardiff Electricity Committee on Monday last when it was stated that the commencing salary had been fixed at £1,000 per annum. Mr. Jones has been associated with the Cardiff Electricity Department for about twenty-three years.

Mr. H. R. Harper, chief engineer of the Victoria Electricity Commission, is paying a visit to England and the Continent, where he will investigate the latest electrical developments, particularly the use of brown coal, water power, and the methods employed in large central transmission and distribution systems. Mr. Harper was a member of the Brown Coal Advisory Committee which in 1917 investigated the possibilities of the deposits at Morwell, and he has taken a leading part in the development of the electrical resources of the State of Victoria. Before his present appointment he was city electrical engineer of Melbourne. He was President of the Institution of Engineers, Australia, in 1933-34, and chairman of the Victoria Division of the Institution in 1931-32 and 1934-35. He is honorary secretary and treasurer of the Victorian and Tasmanian section of the Institution of Electrical Engineers and chairman of the local advisory committee of that body.

Mr. W. F. Bishop, director and general manager of W. T. Henley's Telegraph Works Co., Ltd., who completed forty years' service with the company on Wednesday last, was presented by Sir Montague Hughman on behalf of the directors at a board meeting on April 26th, with a massive silver salver suitably inscribed and bearing the engraved facsimile signature of each member of the board and the secretary. In making the presentation, Sir Montague said that Mr. Bishop entered the service of the company as a junior member of the staff, and he had risen to the position which he occupied to-day. During this period he had earned the respect, goodwill and friendship of all those with whom he had worked. He hoped that the token of their appreciation would ever remind Mr. Bishop of the high regard which his colleagues had for him, and he trusted that he would for many years continue the fine service which he was rendering to the company. Sir Maurice Simpson and Messrs. Lamont, McClelland, and Jacob also paid tributes to Mr. Bishop, who, in reply, expressed his appreciation of their sentiments and his thanks for the gift. He said that when he joined Henley's the head office staff numbered only six, including the managing director

The presentation to Mr. W. F. Bishop
Left to right: Mr. W. McClelland, Mr. J. Lamont, Sir Maurice Simpson, Mr. A. H. M. Jacob, Sir Montague Hughman, and Mr. W. F. Bishop.

Mr. P. N. Rand, M.I.E.E., has been appointed a director of Messrs. G. P. Cosway, Ltd.

Mr. H. Foulds, secretary of Callender's Cable & Construction Co., Ltd., and president of the Chartered Institute of Secretaries, has been re-elected Chairman of the Caterham and Warlingham Urban District Council for a second year of office.

In our last issue we reported that **Mr. A. White** had relinquished the position of general manager of Aron Electricity Meter, Ltd., retaining the office of joint managing director, and that **Mr. L. Freeman,** works manager, had been appointed general manager. We now reproduce the portraits of these two gentlemen.

Mr. A. White **Mr. L. Freeman**

Mr. T. D. Oswald, of the Newcastle & District Electric Lighting Co., Ltd., has been nominated chairman of the North-Eastern Students' Section of the Institution of Electrical Engineers for the session 1935-36.

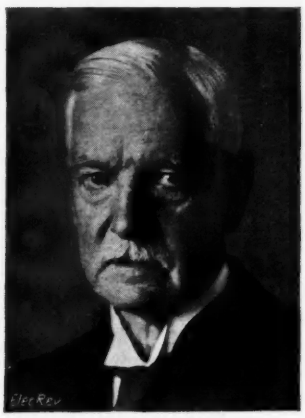
Mr. H. V. Pointon, manager of Asea Electric Ltd., in India, is at present spending a holiday in this country, and communications should be addressed to him care of the company's London office, 5, Chancery Lane, W.C.2.

Mr. A. McKinstry, managing director of Messrs. Babcock & Wilcox, Ltd., has joined the board of the Utilities Corporation (Poland), Ltd.

Mr. E. G. Plucknett has resigned his position on the staff of the Wolverhampton Corporation Electricity Department to join the staff of the International Refrigerator Co., Ltd.

Obituary

Mr. John Henry Holmes, founder of the firm of J. H. Holmes & Co., Ltd., which is now incorporated with Messrs. A. Reyrolle & Co., Ltd., died at Rothbury (Northumberland) on Saturday, April 27th. He was in his seventy-eighth year. Mr. Holmes retired in 1928, and since then had lived with his sister at Rothbury.



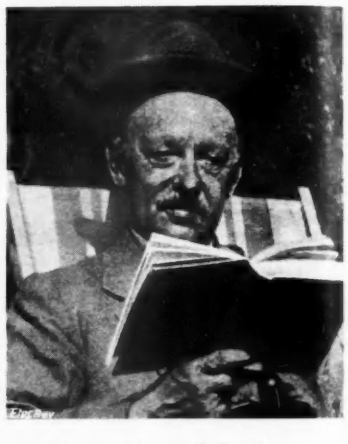
[*Philipson & Sons*
The late Mr. J. H. Holmes

An early pioneer in the electrical industry, he founded the firm of J. H. Holmes & Co. in 1883, and the original premises comprised a workshop with one man and one boy as the employés. Their earliest activities were concerned with supplying electric light to houses, factories, steamships, and for other purposes. The first house on Tyneside to be permanently lighted with electricity was the residence of Mr. Holmes's father. In 1883 Messrs. Holmes supplied electricity for lighting at a new dock at Silloth, Cumberland, by means of arc lamps, while lighting was also supplied to the *Nonpareil*, which was the first merchant ship built on Tyneside to be fitted with electric light. Messrs. Holmes then made a further effort to popularise the use of electricity by purchasing a combined portable boiler and steam engine and providing temporary electric lighting at many public functions. A year later Messrs. Holmes started making their own dynamos and motors, and their first machine, which ran for about twenty-five years in Ireland, is now on exhibition in the Newcastle Municipal Museum of Science and Industry. In 1887 a factory was erected at Newcastle and later extended. The firm was reorganised in 1928 and carried on by Messrs. J. H. Holmes & Co., Ltd., and two years later the works at Portland Road, Newcastle, were transferred to Hebburn-on-Tyne, where premises were erected adjoining the Newtown Works of Messrs. A. Reyrolle & Co., Ltd., and the company was then incorporated with Reyrolle's. In 1933 the company celebrated its Jubilee, reference to which appeared in the ELECTRICAL REVIEW of October 13th of that year. The funeral took place at Jesmond Old Cemetery, Newcastle, on Tuesday last.

Mrs. Kingsbury.—Many of our readers will desire to join with us in expressing deep sympathy with **Mr. J. E. Kingsbury,** M.I.E.E., and his family on the death of Mrs. Kingsbury, which occurred on April 27th at Snow Hill, Crawley Down, Sussex, aged seventy-four years.

Mr. F. Buckley.—The death occurred on April 25 of Mr. Frank Buckley, who had since 1929 been general manager and engineer of the Norwich Electric Tramways Co. He was previously assistant general manager of the Salford City tramways undertaking, and general manager of the Wigan and Bury (Lancs) Corporation Tramways. He had been a member of the executive council of the Municipal Tramways and Transport Association. The funeral took place at Manchester on April 29th.

Mr. J. W. Dodds.—We regret to announce the death, which occurred on April 22nd, of Mr. John W. Dodds, managing director of the E.G.S. Co., Ltd. Mr. Dodds, who was in his sixty-eighth year, was the manager of the business from its commencement in 1897. On the incorporation of the company in 1919 he was appointed managing director and held this position until his death. He was a past president of the Electrical Wholesalers' Federation, and was also a founder of the Sunray Clinic, Newcastle.



The late Mr. J. W. Dodds

Mr. P. H. Reed.—The death occurred on April 29th of Mr. Percy H. Reed, who for over twenty years represented Messrs. Drake & Gorham Wholesale, Ltd., in the South Coast area.

Will.—Mr. Theodor Petersen, assistant managing director of Callender's Cable & Construction Co., Ltd., and the Anchor Cable Co., and a director of Callender's Share and Investment Trust, left £9,040 (net personalty £812).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Exide Batteries (Ireland), Ltd.—Private company. Registered in Dublin April 18th. Capital, £20,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, suppliers of electricity, &c. The subscribers are: I. Atkinson, 8, Lower Cherryfield Avenue, Ranelagh, Dublin, and C. E. Coyne, 13, Windsor Terrace, Dunlaoghaire, Co. Dublin.

A. H. Cornwall, Ltd.—Private company. Registered April 24th. Capital, £1,000 in £1 shares. Objects: To acquire the business now carried on at 64, Victoria Street, S.W.1 as "A. H. Cornwall," and to carry on the business of electrical contractors, electricians, plumbers, hot water and sanitary engineers, manufacturers of all classes of electrical appliances, etc. The first directors are: A. H. Cornwall, 12, Queen's Gardens, Heston, Middlesex (managing director of Halolite Co., Ltd.), and C. D. Daniel, Everest Cottage, St. Paul's Cray, Kent. Secretary: Stanley C. Bacon. Registered office: 64, Victoria Street, S.W.1.

Nicholl Welding & Engineering Co., Ltd.—Private company. Registered April 25th. Capital, £100 in £1 shares. Objects: To carry on the business of welding engineers and welders by electric arc, electric resistance, oxy-acetylene or other processes, &c. The permanent directors are: C. R. Nicholl, 15, Surbiton Hill Park, Surbiton, Surrey, and two others. Registered office: 12, Warner Street, W.C.1.

Clements Radio, Ltd.—Private company. Registered April 25th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus, electrical fittings, &c. The permanent directors are W. A. Clement, "Berwyn," Middle Road, Cwmbwrla, Swansea; and T. W. Clement, Albion House, West Cross, Swansea.

Ransom Bros., Ltd.—Private company. Registered April 18th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in dynamos, motors, armatures, magnetos, batteries, gramophones, &c. The subscribers are: A. E. Ransom, 13, Blake Hill Crescent, Wanstead, E.11, and C. E. Ransom, 241, Dawlish Drive, Goodmayes, Essex. Registered office: 9, Goodmayes Road, Goodmayes, Essex.

Armstrong, Jackson Co., Ltd.—Private company. Registered April 18th. Capital, £100 in £1 shares. Objects: To manufacture, deal in and distribute wireless receivers, transmitters, resistances, batteries, accumulators, &c. The subscribers are: C. C. Jackson, 100, King's Road, Camden Town, N.W.1, and R. Law, 63, London Road, Forest Hill, S.E.23. Secretary: Miss Rhoda Law.

Electro Medical Supplies (Greenham), Ltd.—Private company. Registered April 26th. Capital, £4,000 in £1 shares. Objects: To acquire the business of a manufacturer of electro-medical and artificial sunlight apparatus carried on by C. H. Greenham at 209b, Great Portland Street, W., as "Electro-Medical Supplies." The director are: C. H. Greenham, 209b, Great Portland Street, W., electro-therapeutist (chairman), and G. W. Granham, 91, Salisbury Road, Harrow, works manager.

Leather and Simpson, Ltd.—Private company. Registered April 18th. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless sets, television apparatus, &c. The first directors are: E. Leather, 4, Langett Avenue, Sheffield, and H. Simpson, 128, Archer Road, Sheffield. Solicitors: H. E. Ward & Co., Chesterfield.

Dotolite Co., Ltd.—Private company. Registered April 14th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers of and dealers in electric lamps and electrical goods and appliances of all kinds, &c. The directors are: Dr. V. B. Green-Armytage, 25, Elm Tree Road, St. John's Wood, N.W., and L. N. Epstein, 4, Clive Road, West Hampstead, N.W.6. Solicitor: Ariel L. Solomon, 818, Salisbury House, Finsbury Circus, E.C.2.

Holdsworth Electric, Ltd.—Private company. Registered April 26th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical, mechanical and automobile engineers and contractors, makers and repairers of and dealers in all kinds of electrical, mechanical and wireless goods, &c. The permanent directors are: C. B. Holdsworth, 67, Harden Road, Leamore, Walsall, and G. Holdsworth, 24, Jesson Road, Walsall. Solicitors: James F. Addison & Cooper, Walsall.

Tunewell Neon and Radio, Ltd.—Private company. Registered April 23rd. Capital, £1,000 in £1 shares. Objects: To

acquire the business of Tunewell Radio, Ltd. (in liquidation), heretofore carried on at 54, Station Road, Southgate, Middlesex. The directors are: B. Roston, "Betainu," Ferney Road, East Barnet, Herts, and two others. Registered office: 54, Station Road, New Southgate, Middlesex.

A. S. Nightingale, Ltd.—Private company. Registered April 25th. Capital, £200 in £1 shares. Objects: To carry on the business of electrical, motor, mechanical, wireless, structural, heating, lighting and general engineers, &c. The permanent directors are: A. S. Nightingale, 5, Brook Street, Peterborough; and J. S. Robinson, "Holmlea," Werrington Bridge, Peterborough.

J. R. Landray, Ltd.—Private company. Registered April 27th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical goods of all kinds, &c. The permanent directors are: W. H. Hobbs, 30-32, Waterloo Road, S.E.1, and J. R. Landray, 5, Thorden Gardens, Stoneleigh Hill, Ewell. Registered office: 30-32, Waterloo Road, S.E.1.

Returns of Electrical Companies

Midland Electric Corporation for Power Distribution, Ltd.—The nominal capital has been increased by the addition of £150,000 in £1 ordinary shares beyond the registered capital of £1,000,000.

Thames Valley Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £100,000 in £1 ordinary shares beyond the registered capital of £50,000.

Concordia Electric Safety Lamp Co., Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £60,000.

H. E. C. Electric Co., Ltd.—Capital, £1,000 in 400 preference and 600 ordinary shares of £1. Return dated October 29th, 1934 (filed February 6th, 1935). 170 preference and 203 ordinary shares taken up. £173 paid on 170 preference and 3 ordinary shares. £200 considered as paid on 200 ordinary shares. Mortgages and charges nil.

Darimont Electric Batteries, Ltd.—Capital, £18,000 in 62,000 ordinary shares of 5s. and 50,000 deferred shares of 1s. Return dated December 31st, 1934. All shares taken up. £8,999 16s. paid on 34,666 ordinary and 6,664 deferred shares. £9,000 4s. considered as paid on 27,334 ordinary and 43,334 deferred shares. Mortgages and charges nil.

Telsen Electric Co., Ltd.—(In compulsory liquidation). Satisfaction in full on March 25th, 1935, of debenture dated November 9th, 1933, and registered November 15th, 1933. (According to the register of mortgages, the debenture registered November 15th, 1933, originally secured all moneys due to bank).

S. D. Products, Ltd.—Debenture, charged on freehold factory in Hemel Hempstead, Herts, and the company's undertaking and other property, present and future, including uncalled capital, dated March 23rd, 1935, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., 14, Took's Court, E.C.

Davies, Kent & Stewart, Ltd.—Capital, £3,500 in 2,500 preference and 1,000 ordinary shares of £1. Return dated December 28th, 1934. 2,057 preference and 1,000 ordinary shares taken up. £83 paid on 83 preference shares. £2,974 considered as paid on the remainder. Mortgages and charges £1,350.

Olympia Radio, Ltd.—Three notices of the appointment of Joseph W. Shepherd, of 78, King Street, Manchester, as receiver and manager on April 18th, 1935, under powers contained in instrument dated October 31st, 1933, April 23rd, 1932, and June 2nd, 1932.

Cardiff & District Radio Relay Services, Ltd.—The nominal capital has been increased by the addition of £5,000 beyond the registered capital of £500. The additional capital is divided into 5,000 7 per cent. cumulative preference shares of £1 each.

Pollson, Ltd.—In particulars of this receivership published in our issue of April 26th the date of the debenture was given as June 27th, 1933. This should have read June 27th, 1934.

"P. & B." Engineering Co., Ltd.—Mortgage on land and buildings off Tamworth Lane, Mitcham, dated April 9th, 1935, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

City Notes

The North Wales Power Co., Ltd., which is a subsidiary of the British Power & Light Corporation (1929), Ltd., reports a net profit for 1934 of £43,908, as compared with £17,027 in the preceding year. To this is added £1,450 transferred from general reserve, £1,135 from redemption reserve, and £48,973 brought in, making £95,466 available. Debenture conversion costs amounting to £18,078 have been written off; £9,000 has been set aside for income tax and £25,000 for contingencies. It is proposed to pay a dividend of 4½ per cent. (against 2 per cent.), and to carry forward £8,513. The report states that the drought which had a serious effect on the earnings of the company in 1933 continued throughout the first half of the year and as a result a greater amount of electrical energy had to be purchased from the Central Electricity Board than would otherwise have been necessary. Provision has been made for the purpose of minimising the effect in future of variations in the annual rainfall by the establishment of a contingencies reserve, to which £25,000 has been transferred from appropriation account. Extensions were carried out during the year at the Maentwrog power station, a further pipe line and an additional 6,600 kW set being installed, increasing the capacity of the station to 24,000 kW. Certain of the generating plant at Cwm Dyli station was replaced during the year. The company has obtained Orders from the Electricity Commissioners authorising it to distribute electricity in the Island of Anglesey, Dolwyddelen and Bala, and the construction work in connection therewith is well advanced. Sales of electricity during the year amounted to 80,750,000 kWh, as compared with 68,500,000 kWh in 1933. In adition 23,500,000 kWh was sold under a special contract, as compared with 8,250,000 in the preceding year. Returns for the current year indicate that progress is being maintained. Meeting: May 9th.

The Telephone Manufacturing Co., Ltd.—Presiding at the annual meeting held on April 30th, Mr. F. T. Jackson (chairman), in the course of his speech, said the outlook of the company was much brighter than it had been in the past. At the last annual meeting he stated that negotiations were in progress with a view to the introduction of some measure of rationalisation in the telephone industry which would result in making contract prices more economic. These negotiations continued through the greater part of the year, but did not reach a satisfactory conclusion until the late summer. During the period occupied by these discussions very few contracts were placed, with the result that their factory was ruuning at less than half its capacity. Since the completion of the negotiations, however, there had been a great increase in contracts secured, and they had been placed at prices which showed a reasonable margin. None of the new contracts was completed in the year under review, but would be reflected in the 1935 accounts, provided an even flow of work was going through the factory. The demand for special telephone and other apparatus which they supplied to the operating subsidiaries of Telephone Rentals, Ltd., had been well maintained. During the year their bakelite moulding plant had been extended still further by the addition of more presses. Their condenser department had now definitely come into its own and the demand for their marine telephone apparatus and clocks continued to expand.

The Oriental Telephone & Electric Co., Ltd., has declared a final ordinary dividend of 8 per cent., making 12 per cent., tax free, for the year (unchanged).

The Calcutta Electric Supply Corporation, Ltd., reports a profit for 1934, after providing for depreciation, of £490,775, as compared with £408,913 in 1933. After meeting debenture interest, &c., and placing £50,000 to general reserve and £50,000 to reserve against reduction of rates, it is proposed to pay a final ordinary dividend of 7 per cent., making 12 per cent. for the year, and to carry forward £35,690. Immediately after the close of the year a block of 400,000 preference shares was issued, ranking for dividend as from July 1st, 1934, and sold privately at £1 7s. per share. As the margin of unissued capital is now relatively narrow it is proposed to increase the authorised capital of the company from £4,000,000 to £5,000,000. The company intends to grant to the staff in India a bonus equivalent to 2 per cent. of the Indian net profit in respect of approved service rendered during 1934. The sales of electricity totalled 229,936,667 kWh, as compared with 190,151,448 kWh.

The Charing Cross Electricity Supply Co., Ltd., is to redeem the £392,669 4 per cent. and £481,000 4½ per cent. debenture stocks now outstanding. The 4 per cent. stock will be repaid at par on November 1st, 1935, and the 4½ per cent. stock at 102 per cent. on August 1st next. The company has created £900,000 new 3½ per cent. debenture stock, which Messrs. Baring Bros. & Co., Ltd., have agreed to purchase, subject to an undertaking to provide the company with sufficient stock to meet the requirements of an offer of conversion, which is being made to the holders of the stocks now being repaid. Existing holders are offered £100 new stock for each £100 of their present holdings. There will be in each case an adjusting cash payment in respect of interest, and in the case of the 4½ per cent. stock a 2 per cent. premium. The offer will close on May 7th. The new 3½ per cent. stock will be secured by a first floating charge. The company will have the right to purchase stock for cancellation at three months' notice. Any stock outstanding on November 1st, 1971, is to be repaid at par. The first payment of interest on the new stock will be for a full half-year payable on November 1st, 1935.

The Kalgoorlie Electric Power & Lighting Corporation, Ltd., has announced a final dividend of 4½ per cent., making 7 per cent. for 1934 (against 6 per cent.).

The British Power & Light Corporation (1929) Ltd., in its report for the nine months ended December 31st last shows a revenue received from its subsidiaries, together with other interest and sundry receipts, of £100,373, and a profit for the period of £93,991. This is at the rate of £125,321 per annum, and compares with £83,051 for 1933-34. A dividend of 3½ per cent. actual is proposed on the ordinary shares (against 3 per cent. for the previous twelve months), and £40,954 is carried forward, against £36,922 brought in. With the accounts a statement is issued showing the trading results of the group for the calendar year 1934. After providing for interest, tax, proportion of profits of subsidiary companies accruing to outside shareholders, and preference dividends of the Corporation, the balance attributable to the ordinary capital of the Corporation amounts to £70,757 (against £44,748 in 1933). At the end of 1934 the Corporation issued a further 400,000 6 per cent. cumulative preference shares to shareholders at a premium of 8s. 9d. Operations of the subsidiary companies during the current year to date indicate satisfactory progress. At the meeting to be held on May 10th a resolution will be submitted for changing the name of the company to the British Power & Light Corporation, Ltd., and for converting the issued preference and ordinary shares into stock.

The Altrincham Electric Supply Co., Ltd., reports a profit of £34,625 for 1934, as against £28,657 for 1933, to which is added £6,176 brought in and £5,356 special provision for 1933 now written back, making £46,157 available. The final dividends on the ordinary and deferred shares are unchanged, and £18,273 is carried forward.

The Ever Ready Co. (Great Britain), Ltd., reports a net profit for the year, subject to audit, of £449,579 (including a profit of £19,899 on realisation of investments), as compared with £396,923 in the preceding year. Reserves and carry forward total £1,356,604, as compared with £1,239,344. It is proposed to pay a final ordinary dividend of 25 per cent., maintaining the dividend for the year at 35 per cent., but on larger capital.

Stocks and Shares

TUESDAY EVENING.

AT a time when so much public attention is directed to the Silver Jubilee, all that it recalls and all that it means, a modest review of some of the stocks and shares connected with the electrical industry would appear to be appropriate. It is impossible to do more than treat comparative tables in somewhat sketchy fashion, owing to the changes that have occurred during the past quarter of a century in the nominal values of so many Stock Exchange securities. For instance, most of the ordinary shares in the group of London electricity supply companies used to be of the nominal value of £5 each. To take three representative examples: Bromptons, Chelseas and St. James were all of this denomination. Brompton on May 6th, 1910, stood at 7¾ for the £5 shares. To-day the £1 share is quoted at 33s. 6d. The equivalent of the 7¾ would to-day be 31s., which is rather below the current quotation. St. James' ordinary shares stood at 8¾, equal to 35s. for a £1 share, and to-day the price is 33s. 6d. Chelseas, now at a substantial premium, were then at a discount; the £5 shares could have been bought at a little under £4. City of London ordinary were £10 shares, and were priced at 11¾, equal to 23s. 6d. as against to-day's 36s. London Electrics were of the unusual denomination of £3, the price being 37s. 6d.

Manufacturing Companies' Shares

General Electrics were £10 shares on May 6th, 1910, and whereas the present price of the £1 shares is over 50s., the £10 shares twenty-five years ago stood at 8, equivalent to 16s. Henleys, Callenders and British Insulated were £5 shares, the respective prices being 12¾, 10¼ and 7. A straight comparison is available in the case of Globe Telegraphs, then 10¾, as against to-day's 13. Globe preference, however, are almost the same as they were a quarter of a century back, at 13½. American Telephone and Telegraph, in those days, stood at 140, well above the present figure.

These comparisons give some idea—it is to be honestly hoped an interesting one—of the manner in which certain representative prices have moved during the period. Consols, by the way, are about 7 points higher now than they were on May 6th, 1901.

Four Months' Prices

Continuing this course of comparisons, the past four months have been fraught with such important consequences to Stock Exchange prices that it is useful also to look back upon the transit of values since last year finished. The ordinary shares of the London Electricity supply companies are lower, due to causes that have been set out here from time to time. The formation of the London Associated Electricity Undertakings, which has just unified half a dozen of the principal companies, suggests, rightly or wrongly, that the dividend on the ordinary shares of the companies will be retained at what is regarded as the standard rate of 7 per cent., instead of being advanced during the present twelvemonth. No one can say, of course, at this stage what is going to happen, but prices have gone back to some extent since the end of last year. The alterations in prices in our home supply companies' list are all in an upward direction this week, the most notable being the 2s. rise in Northamptons.

Few of the ordinary shares of the provincial electricity supply companies have moved in favour of proprietors. The majority show declines.

Cables and Wireless

The unexpectedly good dividend declared on the 5½ per cent. preference stock of Cable & Wireless had a strengthening effect upon the preference, but failed to assist either of the two ordinary stocks to any extent. Globe ordinary have gone ahead in sympathy with the rise in Cable preference. Anglo-American issues display, comparatively speaking, moderate and irregular movements. Marconi Marines have gone back in consequence of the recently declared dividend being below expectations.

Manufacturing and Equipment

In the manufacturing and equipment group there has been little cause for excitement throughout the past four months. Business in the principal shares, however, has been fairly active. The lower-priced issues came in for attention, Johnson & Phillips and Siemens, for instance, both being in steady demand. The higher-priced shares generally show some improvement on balance, and it is understood that the companies are doing well. Some, at all events, have received useful, if adventitious, aid from the Silver Jubilee celebrations. During the past week the most important alteration in the manufacturing list was a rise of 3s. 3d. to 52s. in the price of G.E.C. ordinary shares. English Electric and Ever Ready shares also moved upward to the extent of 2s. each. Crompton Parkinsons were higher at 2¼ and Associated Electrical Industries ordinary put on 6d.

The course of gilt-edged prices during the past third of the year has been marked by a fairly general decline in safety-first stocks. The falls have scarcely affected, however, prices of electricity authorities' stocks. In this connection we may conclude this brief résumé by referring to the fact that twenty-five years ago neither the Central Electricity Board nor the London Passenger Transport Board was so much as dreamed of, though some of the units which now compose the latter Board were, of course, in individual operation.

Share List of Electrical Companies

	Nom.	Dividend 1933.	Dividend 1934.	Price. Apl. 29	Rise or Fall.	Yield. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	76/3	—	3 18 9
Brompton Ordinary	1	7	7	33/6	—	4 3 7
Charing Cross Ordinary	1	7	7	33/9	—	4 3 0
Chelsea	1	7	7	33/6	—	4 3 7
City of London	1	7½	7½	36/–	—	4 3 4
Clyde Valley	1	7	8	42/–	+1/–	3 16 2
County of London	1	10½	10½	57/–	+6d.	3 13 8
Edmundson's 7% Pref.	1	7	7	35/–	—	4 0 0
Elec. Dis. Yorkshire	1	9	9	47/6	+1/–	3 15 10
Elec. Supply Corporation	1	11	11	3 1/8	+1/8	3 11 10
Kensington Ordinary	1	7	7	33/6	—	4 3 7
Lancs Light and Power	1	7½	7½	37/6	+1/–	4 0 0
London Electric	1	7	8	37/6	—	3 14 8
Metropolitan	1	10	10	53/6	+1/–	3 14 9
Midland Counties	1	7	7	38/–	+6d.	3 13 8
Mid. Elec. Power	1	8	8	52/–	—	3 1 6
North Eastern Electric Ordinary	1	6	6	33/6	+1/6	3 11 8
Do. 7% Pref.	1	7	7	34/–	—	4 2 4
Northampton	1	10	10	55/9	+2/–	3 11 9
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	60/9	—	3 5 10
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
St. James and Pall Mall	1	7	8½	33/6	—	4 18 6
Scottish Power	1	8	8	41/9	+1/–	3 16 8
South London	1	7	7	35/6	—	3 17 9
Westminster Ordinary	1	7	7	33/6	—	4 3 7
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	27/6	+1/8	5 9 1
Yorkshire Elec.	1	8	8	44/6	+1/6	3 12 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	115	—	4 7 2
Do. 1955–75	„	5	5	118	+½	4 4 9
Do. 1951–73	„	4½	4½	111	—	4 1 1
Do. 1963–93	„	—	3½	101	—	3 9 6
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A	„	—	4½	122½	+1	3 13 6
Do. do. B	„	—	5	127½	+1	3 18 5
Do. do. C	„	3	—	100	+1	3 0 0
West Midlands Joint Elec. 1948–68	„	—	5	115	—	4 7 0
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	115	+5	7 16 6
Anglo-Am. Tel. Pref.	Stock	6	6	115½	+1	5 4 0
Do. Def.	„	1½	1½	25	—	6 0 0
Cable & Wireless 5½% Pref.	„	2¾	4½	87½	+½	4 14 3
Do. A. 7½% Ord.	„	Nil	Nil	18½	—	—
Do. B. Ord.	„	Nil	Nil	6½	–½	—
Globe Tel. & Tel. Ord.	10	Nil	2½	13	–½	1 18 5
Do. do. Pref.	10	6	6	13½	+½	4 8 1
Great Northern Tel.	10	20	20	39½	+1	5 1 3
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	3 1/8	—	*3 12 5
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	2/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	965	—	—
Do. do. Pref. Ord.	„	8	8	170	—	4 14 2
Brazil Traction	100	—	—	9½	–½	—
Brit. Columbia Elec. Rly. Pfce.	Stock	5	5	92½	+2	5 8 1
Mexican Light Common	100	Nil	Nil	4	+3	—
Do. 7% Pref.	100	7	7	5½	+2½	—
Do. 1st Bonds	$500	5	5	39½	—	—
Victoria Falls Ord.	1	15	20	7½	—	3 15 2
Yorkshire (West Riding)	1	2½	5	28/9	—	3 9 9
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	10	66/3	+1/8	3 0 4
Assoc. Elec. Ord.	1	4	6	27/–	+6d.	4 9 0
Do. Prf.	1	8	8	37/–	—	4 6 4
Babcock & Wilcox	1	6	8	45/–	+9d.	3 11 0
British Aluminium Ord.	1	5	7½	32/–	+6d.	4 13 9
British Insulated Ord.	1	5	15	77/6	—	3 17 5
Brush Ord.	Stock	Nil	Nil	37½	—	—
Callender's	1	15	15	3½	—	4 5 9
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	22	12½	2¼	+¼	1 7 9
Do. 8% Pref.	1	8	8	36/3	—	4 8 5
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9
Electric Construction	1	Nil	Nil	15/–	—	—
Enfield Cable Ord.	1	25	25	4¾	—	5 5 3
English Electric	1	Nil	Nil	9/9	+2/–	—
Do. do. Pref.	1	Nil	Nil	17/–	+½	—
Ever Ready	5/–	35	35	24/3	+2/–	7 4 4
Ferranti Pref.	1	7	7	28/6	–6d.	4 18 3
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	52/–	3/3	3 1 6
Henley's	1	30	30	6½	—	4 7 3
Do. 4½% Pref.	5	4½	4½	5½	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	32/–	—	4 13 9
Siemens Ord.	1	6½	4	1 1/8	—	3 15 4
Telegraph Construction	£1	Nil	Nil	1½	—	—

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

21618. "Braking devices suitable for winders, hoists, and the like." General Electric Co., Ltd., A. L. G. Lindley and F. L. Whitmore. August 1st, 1933. (426394.)

21695. "Wireless direction and position finding." R. A. W. Watt, J. F. Herd and L. H. Bainbridge-Bell. August 2nd, 1933. (426328.)

21964. "Protective devices for electric circuits." British Thomson-Houston Co., Ltd. August 4th, 1932. (426628.)

23820. "Means for controlling the voltage generated by an alternating-current oscillator." L. E. Ryall. August 28th, 1933. (426396.)

24241. "Electric incandescent lamps." Z. Dezsoe. September 1st, 1933. (426477.)

26596. "Method for preventing the leakage of energy from charged electric accumulators." F. Kolousek. September 27th, 1933. (426481.)

26738. "Electrical remote-control installations." J. T. Shevlin (Siemens-Schuckertwerke Akt.-Ges.). September 28th, 1933. (Convention date not granted.) (426337.)

26805. "Apparatus for supplying direct current to radio receivers or the like." E. K. Cole and G. Bradfield. September 9th, 1933. (426483.)

26889. "Armature windings for dynamo-electric machines." A. Allison. September 29th, 1933. (426340.)

26947. "Apparatus for testing and sorting electrically conducting parts or packages." British Thomson-Houston Co., Ltd. September 30th, 1932. (426555.)

26964. "Automatic volume control for radio-receiving apparatus." S. A. Stevens, L. E. Thompson and Westinghouse Brake & Saxby Signal Co., Ltd. September 30th, 1933. (423634.)

27070. "Electrically operated arrival and departure indicator system." Siemens Bros. & Co., Ltd., and J. H. Broome. October 2nd, 1933. (Cognate application 6096/34.) (426558.)

27071. "Electrical actuating means for a time indicator." Siemens Bros. & Co., Ltd., J. H. Broome and A. A. Southam. October 2nd, 1933. (426559.)

27175. "Electric transformers." J. B. Hansell and Associated Electrical Industries, Ltd. October 3rd, 1933. (426561.)

27180. "Thermally released electric overload circuit-breakers." British Thomson-Houston Co., Ltd. October 3rd, 1932. (426486.)

27320. "Wireless receiving systems." A. C. Cossor, Ltd., and J. H. Reyner. October 4th, 1933. (426350.)

27322. "Apparatus for producing high-tension alternating current from direct-current source, especially for luminous tubes, medical apparatus, and the like." I. Low-Stieglitz. October 4th, 1932. (426487.)

27327. "Apparatus for electrically recording signals." Electrical Research Products, Inc. October 20th, 1932. (Cognate application 27328/33.) (426488.)

27362. "Stabilised resistance elements." A. H. Stevens (Continental Carbon, Inc.). October 4th, 1933. (426490.)

27376. "Lift-controlling mechanisms." General Electric Co., Ltd., N. C. Smart and B. F. Moss. October 5th, 1933. (426492.)

27512. "Junction fittings for use in connection with electrical conduit tubes." J. Wootton, H. Wootton, T. Somerfield, W. J. Garratt and H. Garratt. October 6th, 1933. (426353.)

27561. "Metal-clad vapour-electric convertors." General Electric Co., Ltd., and E. Gallizia. October 6th, 1933. (426641.)

27691. "Electric synchronous motors." Lowne Electric Clock & Appliances Co., Ltd., and F. R. M. Lowne. October 7th, 1933. (426650.)

27754. "Driving and braking of electric motor-driven sewing and other machines." Croydon Engineering Co., Ltd., and P. S. Firmin. October 9th, 1933. (426409.)

27781. "Speaking heads for telegraphones and the like." Stille Inventions, Ltd., and K. von Heising. October 9th, 1933. (426653.)

27901. "Electric cables." Callender's Cable & Construction Co., Ltd., and P. V. Hunter. October 10th, 1933. (426354.)

28096. "Electric batteries." C. J. Gordon. October 11th, 1933. (426654.)

28369. "Containers for metal-clad vapour electric-arc convertors." General Electric Co., Ltd., and E. Gallizia. October 13th, 1933. (426497.)

29207. "Time-control arrangements for wireless receiving sets." A. H. Shiers. October 21st, 1933. (Cognate application 5820/34.) (426355.)

29321. "Electric motor controllers." British Thomson-Houston Co., Ltd. October 22nd, 1932. (426414.)

29426. "Television and like systems." G. B. Banks, J. C. Wilson and Baird Television, Ltd. October 24th, 1933. (Addition to 398512.) (426356.)

29656. "Electric arc lamps." C. Zeiss. October 28th, 1932. (Cognate application 35784/33.) (426569.)

30893. "Illuminating lamps and reflectors therefor." Foster & Pullen, Ltd., and H. R. Stevenson. November 7th, 1933. (426418.)

32413. "Circuit arrangements embodying vapour-electric devices." Westinghouse Electric & Manufacturing Co. November 25th, 1932. (426360.)

32813. "Electrical signalling systems." Siemens Bros. & Co., Ltd., and A. Rosen. November 23rd, 1933. (426664.)

33116. "Electricity maximum-demand indicators." Chamberlain & Hookham, Ltd., and S. James. November 27th, 1933. (426362.)

33598. "Metal-clad vapour-electric convertors." General Electric Co., Ltd., and E. Gallizia. November 30th, 1933. (426666.)

34329. "Electric motors." British Thomson-Houston Co., Ltd. December 9th, 1932. (426504.)

34346. "Television transmitting and like systems." W. F. Tedham. December 6th, 1933. (426505.)

34374. "Electric fuses." V. Hope. December 7th, 1933. (426668.)

36009. "Electric cable systems." Okonite-Callender Cable Co., Inc. December 21st, 1932. (426363.)

36485. "Magneto-electric machines." British Thomson-Houston Co., Ltd. December 29th, 1932. (426671.)

36501. "Electric cable systems." Okonite-Callender Cable Co., Inc. December 28th, 1932. (426511.)

1934

52. "Electric circuits comprising a gasfilled triode or the like." General Electric Co., Ltd., E. C. Cherry and L. I. Farren. January 1st, 1934. (426364.)

259. "Television systems." Marconi's Wireless Telegraph Co., Ltd. January 3rd, 1933. (426672.)

966 "Electric-carrier signalling systems." General Electric Co., Ltd., and N. R. Bligh. January 10th, 1934. (426437.)

967. "Electric-carrier signalling systems." General Electric Co., Ltd., and N. R. Bligh. January 10th, 1934. (426512.)

1108. "Electric selector switches." Siemens Bros. & Co., Ltd., H. E. Humphries and E. J. Gachet. January 11th, 1934. (426367.)

9621. "Pin-type electric insulators." Bullers, Ltd., H. C. R. Dagnall and G. H. Harris. March 27th, 1934. (426584.)

14660. "Electrical rectifiers of the ionised metallic-vapour type provided with anode-control grids." Forges et Ateliers de Constructions Electriques de Jeumont. May 23rd, 1933. (426377.)

16946. "Electric motors." British Thomson-Houston Co., Ltd. June 10th, 1933. (426529.)

18112. "High-tension electric insulating bushings of the condenser type." E. Haefely & Cie. Akt.-Ges. June 20th, 1933. (426530.)

19442. "Floodlighting apparatus." Chance Bros. & Co., Ltd., W. M. Hampton, H. Gough and J. G. Holmes. July 2nd, 1934. (426592.)

19430. "Adjustable resistances." Central Radio Laboratories. July 7th, 1933. (426690.)

22362. "Continuous-current motors." Akt.-Ges. Brown, Boveri & Cie. July 31st, 1933. (426534.)

23063. "Internal-combustion locomotives with electrical power transmission." Maschinenfabrik Augsburg Nürnberg Akt.-Ges. August 25th, 1933. (426536.)

23383. "Electric oscillators." Fernseh Akt.-Ges. August 12th, 1933. (426537.)

24648. "Spring mechanism for electric switches." F. L. Cook. August 27th, 1934. (Addition to 12346/34.) (426597.)

24815. "Spring mechanism for electric switches." F. L. Cook. August 28th, 1934. (Addition to 12346/34 and 24648/34.) (426598.)

24933. "Electric coils, particularly for loading trunk-communication lines." Siemens & Halske Akt.-Ges. September 29th, 1933. (426469.)

27026. "Lift-controlling mechanisms." General Electric Co., Ltd., N. C. Smart and B. F. Moss. October 5th, 1933. (Divided out of 426492.) (426386.)

32816. "Thermionic valves." Compagnie Générale de Télégraphie sans Fil. December 9th, 1933. (426612.)

34155. "Electrically operated hand tools." R. Bosch Akt.-Ges. December 2nd, 1933. (426614.)

34323. "Tuning indicators for wireless or like signal receivers." General Electric Co., Ltd., H. C. Turner and A. Sherwin. November 29th, 1934. (426615.)

34436. "Means for reducing interference by electric motors with radio signals." Hoover, Ltd. (Hoover Co.). November 30th, 1934. (426388.)

34871. "Photo-electric cells." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 14th, 1934. (426389.)

1935

2219. "Electric submarine-cable signalling systems." Electrical Research Products, Inc. July 21st, 1933. (Cognate application 2220/35.) (Divided out of 35642/33.) (426547.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 24th:—

Biconite. No. 557170. Class 18. Electric welding plant.—British Insulated Cables, Ltd., Prescot, Lancs.

Polvanthus. No. 559092. Class 50. Articles made from synthetic resin, cellulose derivatives, casein or bitumen.—James Scott St. Barbe Baker, trading as the James Scott Manufacturing Co., 41, Boleyn Road, Dalston Junction, N.16.

Preventing Radio Interference

In connection with the efforts now being made to minimise electrical interference with broadcast radio reception Messrs. Ward & Goldstone, Ltd., draw our attention to certain specialities of theirs, such as the "Metocel" low-loss screened aerial down-lead, which consists of a conductor air-spaced by means of centralising nipples in a rubber tube that is covered with cellular weave, then metal screening and finally outer braiding. Multi-shell screened air-spaced flexible down-lead is similar, but is specially recommended for tropical countries or where climatic conditions are severe. Both types are said to have been installed by the British and Dominion Governments and the B.B.C. The "Statoformer" is stated to be largely used in America. It is an impedance matching device, forming with the twin "Statolead" (screened small diameter down-lead cable) a one-turn (earthed) coupling between the aerial and set tuning coil. It enables from one to four receivers to be operated independently from a single aerial. The "Telestat" is for use between 12 and 600 metres. It comprises a twin feeder cable with an earthed sheath and is connected through auto-transformers, *i.e.*, step-down from the aerial and step-up to the receiver. By employing a suitable length for a horizontal dipole aerial effective operation can be obtained down to 7.5 metres.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Additions to the Royal Mental Hospital; J. B. Nichol, architect. Alterations and additions to Skene Square School, for Corporation Education Department; J. A. O. Allan, architect.

Accrington.—Houses (20), Charter Street; borough engineer. Extensions to Ewbank Works; Entwistle & Kenyon.

Atherton.—Houses (39), Hendon Street and Hendon Grove; A. Hulme, builder, 55, Leigh Avenue, Leigh.

Barrow-in-Furness.—Houses (150), Walney; J. Parkinson & Sons, builders, Parliament Street, Lancaster.

Bedfordshire.—Extensions to Aspley Heath Mixed School; H. C. James, Ltd., Luton. Extensions to Langford Infants' School; Messrs. Wright, builders. Schools, Stewartby, for County E.C.; Oswald P. Milne, architect, 64, Wigmore Street, London, W.

Bexhill-on-Sea.—Development of Woodsgate Estate, for F. J. Harris; J. E. Maynard, architect.

Bexley.—R.C. schools, Belle Grove Road, Welling, for Managers; C. J. Nevatt, chairman.

Billingham-on-Tees.—Houses (124), Cowpen Lane Estate; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Bilston.—Infants' and junior school (450 places) for E.C.

Birkenhead.—Houses (24), Orred Estate, and library, Grafton Drive; borough engineer. Houses (132), Townsend Road and Challis Street, for Curlander Estates, Ltd.; W. V. Jenkins.

Bootle.—Houses, Bulwer Street and Pleasant Street; borough engineer.

Brighton.—Shops and flats, St. George's Road; borough surveyor.

Brynmawr.—Houses (52); Council's surveyor.

Caerphilly.—Extensions, including new pavilion to Isolation Hospital; Davies & Lloyd, builders, Senghenydd.

Cambridge.—Swimming stadium, Parkside; G. P. Banyard, architect, Market Street.

Cannock.—Houses (44); R.D.C. surveyor.

Canterbury.—Rebuilding business stores, 5 and 6, The Parade, for Timothy Whites & Taylors, Ltd., Chandos Street, Portsmouth.

Carlisle.—Houses, Currock House Estate and Raffles Newtown Estate; city engineer.

Chelmsford.—Houses (20), Moulsham Drive, for W. J. Aldred.

Chester.—Conversion of chapel, Pepper Street; Anchor Motor Co., Ltd. News cinema, for C. W. Fennell; Wm. & Segar Owen, architects, Warrington.

Colchester.—Reconstruction of business stores, High Street and Head Street, for Boots, Ltd., Nottingham.

Cornwall.—Secondary school, Helston; County architect, Truro.

Coventry.—Clinic, Gulson Road (£14,800); city engineer.

Croydon.—Two factories, café and laundry, Commerce Way; Croydon Factory Estate, Ltd. Two schools, and extensions to schools, A. Sunderland, architect. Extensions to Mayday Hospital (£23,000); borough engineer and Mansell, Ltd. Extensions to St. Gertrudes Church, Purley Way; Rev. W. H. Pritchard.

Cuddington (SURREY).—Alterations and additions to Isolation Hospital; Williams, Pettett & Gardner, architects, Reid's Buildings, Ashley Road, Epsom.

Cupar.—Houses (48), Skinner's Steps; J. M. Alexander. burgh surveyor, Ladywynd.

Depwade (NORFOLK).—Houses (66); R.D.C. surveyor. Pulham.

Dunmow.—Houses (20); R.D.C. surveyor.

Durham.—Schools, Billingham, Shotton, and Stockton-on-Tees; also alterations and additions to West Stanley Alderman Wood Secondary School for E.C.; county architect, 34, Old Elvet, Durham. Alterations to Co-operative Laundries, Ltd., Neville's Cross; C.W.S. Architects' Department, 90, Westmorland Road, Newcastle-on-Tyne.

Dursley.—Houses (112), adjoining Kinghill Road; L. J. Watts, builder, Bristol.

East Sussex.—X-ray block, Southlands Hospital, Shoreham-by-Sea, for P.A.C.; E. A. Verger, county architect, Lewes.

Eccles.—School and extensions to two schools; Biram & Fletcher, architects, St. Helens. Extensions to Atlas Works, Patricroft; H. Clarke & Co. (Manchester), Ltd.

Enfield.—Rebuilding, 30, The Town; Bowyer & Bowyer.

Erith.—School (288 places), Bedonwell, for E.C.; U.D.C. surveyor.

Essex.—Enlargement to County High School for Girls, Brentwood; county architect. Secondary school, Chadwell Heath, for County E.C.

Exeter.—Houses (274), Tollards Farm and St. Loyes Estates; baths, Barnfield site, and market, Marsh Barton (£80,000); city engineer.

Gargrave (YORKS).—Business premises for the Co-operative Society.

Gateshead-on-Tyne.—Houses, Rose Street; F. H. Patterson, borough engineers, Municipal Buildings, Swinburne Street.

Gosport.—Church, for Brockhurst Baptist trustees; L. M. Field, architect, High Street.

Grimsby.—School, Carr Lane (£31,250); R. M. Phillips & Son, Ltd.

Guildford.—Houses (1,000), Fairlands Estate; A. B. Johnstone, New Park, Cranleigh.

Hatfield.—Head Post Office, for H.M. Office of Works; Honour & Sons, builders, Tring.

Herne Bay.—Cinema and shops, High Street, for Odeon (Herne Bay), Ltd.; A. Mather, architect, John Street, London, W.C.

Hinckley.—Houses (56), Lower Coventry Road; F. J. Knight, builder, Keresley, Coventry. Houses (246), Wykin Hall Estate; Economic Housing Estates.

Hornchurch.—Extensions to Sutton's Institution (£216,616); Harold Arnold & Sons, Ltd., builders, Doncaster.

Hull.—Factory, Old Harbour; British Cocoa Mills (Hull), Ltd. Premises for Humber Properties, Ltd., New North Bridge; Horth & Andrew, architects. Extensions to works, Cleveland Street; C. Raine & Sons, Ltd.

Ilkley.—Senior school (480 places), for Education Sub-Committee.

Irvine.—Houses (100); Quarry Road (£28,000); W. L. Weir, burgh surveyor, Burgh Chambers.

Jarrow-on-Tyne.—Houses (36) for aged people, Monkton; J. S. Weir, borough engineer.

Keighley.—Welfare centre, Westgate area; Maternity and Child Welfare Centre.

Kettering.—Extensions to factory, Havelock Street; Aquascut, Ltd. Extensions to factory, Union Street; S. Patrick, Ltd.

Kingsbury.—School, Springfield Estate (£19,444); W. S. Try, Uxbridge.

Lancashire.—Senior school, Rishton, for County E.C.; director of education, Preston.

London.—(BATTERSEA).—Two blocks of flats, Stewarts Lane; borough engineer. Modernisation of houses, Shaftesbury Park Estate for Artisans and General Dwellings Co., Ltd.; M. T. E. Jackson. Reconstruction of Grammar School; Governors, The Walter St. John Foundation. (BERMONDSEY).—Factory, Abbey Street; H. W. Wagstaff. Flats (150), Adams Garden area; borough engineer. Rebuilding, 54-8, Tanner Street; J. & W. Dunn, Ltd. (ISLINGTON).—Flats (115), Warltersville Road; E. C. P. Monson, architect. (POPLAR).—Flats, Collins Place; borough engineer.

Lymm.—Houses (180), Manor Farm Estate; U.D.C. surveyor.

Maidstone.—Block of working-class flats, King Street; borough surveyor.

Manchester.—Houses (1,000), Sheepfoot Lane, Heaton Park; J. G. Whitelegge, builder, 4, Pennell Street, Clayton. Houses (253), Pike Fold Estate; Simms, Son & Cooke, Ltd. Houses (106), Ten Acres Lane, by direct labour; city architect.

Mansfield.—Houses (176), Racecourse site; borough surveyor.

Melksham.—Cottage hospital; Sir George Oatley, architect.

Middlesbrough.—Houses (36), Benton Road; N. Thompson, Ltd., builders, Stonehouse Street, Linthorpe. Extension of bakery premises, Market Place, for the Co-operative Society; C.W.S. Building department, West Blandford Street, Newcastle-on-Tyne. Reconstruction of premises, Beaumont Road, for the Co-operative Society; N. Thompson, builder, Stonehouse Street.

Morecambe.—Houses (37), Kayswell Road; Kay Building Co. Bus station, Euston Road, for Ribble Motor Services, Ltd.

Newcastle-on-Tyne.—Houses (24), Broomridge Avenue; Hadden & Hillman, Ltd., builders, Huddlestone Road. Garage with offices, &c., Shields Road; F. M. Dryden, architect, 6, Market Street.

Northern Ireland (LURGAN).—Public elementary school, King's Park; J. St. J. Phillips, architect, 16, Donegall Square South, Belfast.

Oxford.—Extensions to Melham Ford School for City E.C.

Perivale.—Extensions to factory for Hoover, Ltd.

Peterborough.—Swimming pool, &c. (£20,947); J. Simms, Son & Cooke, Ltd., Nottingham. Elementary school, Park Lane Estate, for E.C.

Ripon.—Swimming baths (£7,500); city surveyor.

Rochester.—Houses (52), Temple Farm Estate, for Strood R.D.C.; surveyor.

Romsey (HAMPSHIRE).—Town hall; borough surveyor.

Rutherglen.—Cinema, Main Street; R. V. Singleton, United Cinemas.

Sedgefield.—Houses (250) in connection with slum clearance scheme; R.D.C. surveyor. Church; R.C. authorities.

Sevenoaks.—Houses (156); R.D.C. surveyor.

Sheffield.—Houses (446), Arbourthorne Estate; city architect. Houses (23), Lydgate Road; T. V. & W. L. Simpson.

Smethwick.—Extensions to Hospital; borough engineer. Extensions to works, Dartmouth Road; Henry Hope & Sons, Ltd.

Southend-on-Sea.—Houses (69), bungalows and flats; borough surveyor.

Southgate.—School, Green Lane (£22,652); J. Stewart & Sons, Ltd., Tottenham.

South Molton (DEVONSHIRE).—Houses (20); R.D.C. surveyor.

South Shields.—Residential hotel and hall on the sea front; T. A. Page, Son & Bradbury, architects, 67, King Street.

Surrey.—School (360 places), West Byfleet, for County E.C.; secretary, Kingston-on-Thames.

Sutton Coldfield.—Houses (32), King's Road; R. Hill. Fire station, Upper Clifton Road; borough engineer. Extensions to cinema, Lower Parade; Empress Cinema, Ltd.

Tynemouth.—Concrete block factory, Billy Mill Quarry; borough surveyor. Flats (24), Howden Road; Square Building Trust.

Tyneside.—Aircraft factory; Bellanco Co. of America.

Warrington.—Cinema, for C. W. Fennell; William & Segar Owen, architects, Palmyra Square, Warrington.

Wellington (SHROPSHIRE).—Houses (86), Slang Lane; U.D.C. surveyor.

West Riding.—Extensions to Royds Hall Secondary School, Huddersfield, and senior school, Flockton, for County E.C.; director of education, Wakefield.

Weymouth.—Houses (120), Golf links site; borough engineer. Masonic Hall, Wardcliffe Road; United Services Lodge.

Whitehaven.—Junior and senior schools, Kells, for Borough E.C.; director of education.

Wigan.—Houses (50). Almond Brook, Shevington; J. Haydock, builder, Bungerhill Road, Wrightington.

Winslow (BUCKINGHAMSHIRE).—Houses (46); R.D.C. surveyor.

Worthing.—Houses (200); R.D.C. surveyor.